FOURTH ANNUAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY,

1880.

CAMDEN, N. J.:
PRINTED BY SINNICKSON CHEW.
1881.

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REPORT OF THE SECRETARY OF THE BOARD

To His Excellency, George B. McClellan,

GOVERNOR:—On behalf of the State Board of Health of New Jersey, I have the honor to present to your Excellency a brief survey of the work of the Board for the past year, and such accompanying statements, papers and reports as bear upon the vital conditions of the people. The increase of duties assigned to us by the last Legislature, the formation of very many new local Boards of Health, the occurrence of several endemic diseases and the inquisitive spirit manifested as to various matters of health administration, have required, as never before, our active attention. The law which requires local Boards of Health to be formed, has resulted in a large increase of interest in local health administration. Subjects of the utmost importance to our citizens are thus locally discussed and public opinion is educated by the information which is sought and secured from various sources. One of the designs of this Board has for the first time been fully realized, the past year. Its advice has been sought in many measures of local interest, so that the service the State is thus doing has come to be appreciated, both in the interests of health, and the prosperity that so much depends thereupon. The local reports we are receiving, enable us to estimate the general condition of the population, while the vital statistics are giving us records of precision as to the courses and causes of disease. In nearly all the localities that most need it, there are now those who have an intelligent conviction of many things needing to be done, and who are seeking to make that public opinion, which must ever precede, or to a reasonable extent accompany, legal enactments. Foundations are being laid for a careful, systematic and faithful administration of those public affairs which have to do with the most vital concerns of our population.

While we have to regret the occurrence of some endemic diseases of a fatal character and a wide-spread extension of periodic fevers, yet the prevalence of serious or fatal disease was much less than for the period of our last report. The returns made up from July to July of each year show a less number of deaths by about twelve hundred than the previous year. While localities have suffered, there has been no wide-spread, fatal epidemic. The study of health questions is becoming organized into a system. From many of our cities and from some county and village localities, we have evidence of a comprehension of the necessities of a close watchfulness over the causes of disease, with a view to their prevention or abatement. It is no longer viewed as merely a professional matter, but as one which concerns the industrial welfare of the people. The advice of the Board is often asked in matters of local health administration, and we have thus been able to aid local authorities. We are now fairly in the position for a comprehensive oversight of the health interests of the State, and will be able to indicate how those evils are to be guarded against, which most imperil the life and health welfare of our citizens. Much information in this direction is diffused by the annual State report, as well as by personal correspondence and other agencies which we are able to promote. The library of the Board now presents a good outline of the various subjects of sanitary science and art, and we trust ere long to make it more extensively accessible to the people. Specimens of maps and other appliances also serve as models for the work necessary to be done by many of our cities and some of our closely settled rural districts. The wide duties imposed under the present law have brought us more in contact with localities and enabled us to indicate the most pressing wants. Requests are frequent for the presentation of these subjects to public attention, in connection with Teachers' Institutes and by Local Boards.

It has been our plan, in connection with the report of the secretary, to fully consider some one of the more prominent prevailing diseases of the State. Last year periodic or other malarial diseases were considered.

DIPHTHERIA

Has been, for several years past, so prominent and fatal a disease in this State, that it merits our most careful and inquisitive investigation. It has taken its place as fourth in the English list of zymotic diseases and is equally prominent in our own bills of mortality.

The order of diseases known as *zymotic* gets its name from the Greek word which means "causing to ferment," because such diseases were regarded as somehow allied to or as cperating through such a process. While we cannot accept the term as defining the modus operandi, there is need that the various laws of fermentation be studied as in nature, as allied yet distinct and as related to animal or vegetable organism. Also that we study especially putrefactive ferments or putrefaction as distinct from usual fermentation, since it is toward the latter that many of the zymotic diseases seem to incline. "There are two species or groups of fungi, the yeast or ferment plants, and the putrefactive fungi which are developed during the process of putrefaction." Parkin, p. 29.

As these diseases are alike, in that they are believed to depend for their inception upon infective particles derived from without, such questions as these are opportune.

How can the production of the infective be prevented? If not prevented, how can exposure to it be avoided or lessened? If there must or may be exposure, how can the sedation or location of the particle in the human system be hindered or embarrassed? If likely to find some local lodgement, how can the part be put in such a condition as to fortify against it?

Or can there not be some substance introduced into the blood or secretions and for a time maintained there, that will render the system refractory to the process which the infective particle would otherwise set up, and which thus constitutes the disease?

If the gravity of the disease depends upon some chemical or decomposing changes which could be held in abeyance, or on the rapid multiplication of vegetable or animal organisms, which mechanically or otherwise cause a higher life to succumb to such prolific invasion, is it not possible to prevent the setting up of such processes by antizymotics or antiseptics.

The discussion of these points, however pertinent to any one of these diseases, can not now be entered upon at length, but they are to be thoughtfully borne in mind. If the ideas entertained by us as to these epidemic diseases, and their possibility of limitation and prevention by individual sanitation are correct, the future success offered to medicine is as much beyond the one limitation of small-pox as the application of a general life-preserving law is beyond the prevention of only one disease.

Diphtheria first found its record in the registry of the Registrar General of England, in 1855, as separate from scarlet fever, of which it before had been recognized as somtimes a complication. About the same time it began to attract attention in this country by an occasional outbreak. The first article as to it in the New York State Medical Transactions was in 1859.

In a full report of the diseases of Newark for the year 1858, in the New Jersey State Medical Transactions, it is not named.

In January, 1859, the reporter for Essex county says: A few sporadic cases of diphtheria have occurred, "some fatal, all very severe and demanding very careful treatment."

The State report made January, 1861, says: "The reports received by the committee notice, in every case, diphtheria as epidemic to a greater or less degree. It has been most prevalent in Essex, Hunterdon, Cumberland and Gloucester.

Ever since, in varying degrees of prevalence, it has found its place among the most serious yearly diseases with which we have to contend.

The number of deaths cannot be accurately stated, as returns from localities were often defective. Under the recent law, the more completed registry shows eleven hundred deaths from July 1st, 1878 to July 1st 1879, and the vital statistic report shows the deaths from July 1st, 1879 to July 1st, 1880. It far exceeds at present, in fatality, any of the communicable zymotic diseases. It is universally recognized as belonging to the class of ailments dependent to a large degree upon preventable causes.

Whether it is an old disease, recurring in its cycle, or recurring because, by other methods, we are imitating the filth of ancient civilization and over-crowding, it is not easy to determine. The general view is that it is the recurrence of a disease heretofore

described. In the identification, we find many descriptions of sore throat which are only analogous and strained into identity.

It is no more surprising a thing that a new disease should occur than that a new chemical compound should be discovered, or that life under new disturbing conditions should functuate varied phenomena. Although finding mention in the supplementary table of the causes of death in England in 1855, it does not receive extended notice from General Graham until 1858.

"Diphtheria," says he, "according to the popular theory, is bred in France—where the conditions are more favorable on the whole than they are in England—to the diffusion of putrid effluvia over the fauces.

Every Englishman admires the works of art, the picture galleries, the houses, the furniture, the cultivated personal tastes which surround him on every side in Paris, or on a small scale in Boulogne; he admires some of these objects every day, others every week; but has every day to give up his admiration at the door of that inscrutable *cabinet*, where the light of French refinement never comes; where his throat is assailed by the poisonous distillations that engender disease, and explode—if you count well the victims—with much more fatal consequences than gunpowder, or even than fulminating quicksilver. That men should lock up jewels in cabinets, keep their larders full of delicacies, or stock their cellars with wine, is natural; but it is a singular absurdity in civilized countries for men to attempt to hoard for years this volatile essence, which bursts its chains, and, like an unclean spirit, enters not only every apartment in the house, but every channel of access to the living chambers of the body, leaving at times such traces of its passage as diphtheria in the throat.

The disease once generated, wanders abroad and destroys life under circumstances quite different from those in which it was born; but impurity is always its natural ally.

The Scotch threw these matters into the streets, and justly incurred the censure of the fastidious.

In London, and even in the country mansions, retreats still exist which may rival the French magazines of impurity, but it has of recent years, been the practice to throw the guano compounds of London, with water, into the sewers; which, though not constructed for the reception of such matters, and consequently suffering

their volatile principles to escape into the streets, convey a portion of their elements to the Thames, and commit them to its flood of tidal waters.

Dr. Barker has recently performed an ingenious series of experiments on animals, to determine the effects of each of the noxious principles which arise from cesspools. He placed the animals in a close chamber by a cesspool, with which a tube opening into the chamber communicated; and a lamp was arranged so as to draw a current of cesspool air steadily over the creatures inside. With a pair of bellows, Dr. Barker could draw the air from the chamber.

A young dog in half an hour became very uneasy and restless; he vomited, and had a distinct rigor, and in the course of a day was exhausted.

When he was removed he soon recovered. "Another dog was subjected to the cesspool air during twelve days; in the first seven days he underwent a series of sufferings, not unlike the symptoms of the diseases of children in hot weather; on the ninth he was very ill and miserable." After he was liberated, on the twelfth day, he remained "very thin and weak for six weeks."

Dr. Barker then continued his experiments on the effects of definite doses of the gases in the sewers, and killed or poisoned several sparrows, linnets, jackdaws and dogs.

Thus, Dr. Barker has, for our instruction, imitated on a small scale, and on a few of the inferior animals, the vast experiment which is constantly going on, and destroys thousands of men, women, and children in all England.

Instead of a few animals in a close chamber, more than two millions of people live in London over sewers and cesspools. The poison is generated in every house; it is distributed conveniently along all the lines of road, so as to throw up its vapors into the mouths, throats, and lungs of the people through innumerable gully-holes, which are either left untrapped or trapped imperfectly, in order that the poisonous gases might escape. A variation in the pressure of the atmosphere draws up the stinking air from the sewers, like Dr. Barker's bellows.

All the details of the experiment were as carefully contrived by the engineers of the old sewers' commissioners, as if they were constructing an apparatus for passing currents of poisonous

airs steadily over the people of London, with a view, like Dr. Barker, to ascertain their exact effects.

The engineers of the new Board of Works have endeavored to keep the apparatus in order. It is now time that this cruel experiment should cease. Last year, when no epidemic prevailed, not less than 14,795 unnatural deaths were registered in London. This was the aggregate effect of the impure airs, and of other sanitary defects."

The criticism is severe but in many regards sustained by continued experience, and still applicable in this country.

Since these utterances were penned very many attempts have been made to identify the "infective particle" of diphtheria, or to define the precise conditions under which its exciting cause is generated. It is not surprising that science and art should still fail to identify it, but this does not vacate the value of much knowledge we have acquired as to this disease. It is distinct from the usual eruptive diseases and has a marked septic character.

Each year has given increased conviction, that it does not, after having been started from a focus, acquire epidemic prevalence without the aid of foulness derived from household conditions. It is still a careful study with physicians whether it has chiefly to do with putrefaction and excretal charges—especially the excretion of human beings—whether it arises from sewers or from refuse from which all human excretion have been excluded, and how far dampness or excessive stagnant moisture may cause the special production which gives rise to this disease. Although more than most of the crowded-life diseases, it prevails in the country, yet when thus occuring it is frequently fostered by local conditions, or its introduction can be traced to a foul source.

Tyndall has shown that the countless myriads of motes that are seen dancing in every sunbeam are organic particles, and that among them are zymotic bodies which are germs of disease. These bodies are in concentrated force in the rooms occupied by persons suffering from such a disease as scarlet fever and we are always to seek dilution, ventilation and isolation.

We can therefore emphasize a sentence already quoted—"The disease once generated wanders abroad and destroys life under circumstances quite different from those in which

it was born; but impurity is always its natural ally." If the congener of its development is a sporule, or an animalcule, or only an undefined molecule, it may light upon any soil; but if surroundings are good and the person in good condition of life, the rule will be that it will seldom display vigor and virulence, and under such relations can never acquire epidemic momentum. Where there is large production of infective material from excessive and extended foulness "we may conceive the different kinds of zymotic matter distributed in clouds," and that like strata of air or emanations from factories these may have their floating direction governed by specific gravity by trees, by winds, by the humidity of the atmosphere, and thus different localities be differently exposed. But be assured where the local conditions or those of the individual are favorable—there the chief outbreaks will occur.

So far as diphtheria is concerned, the present showing and summing up of all evidence is that it takes its place among the diseases nurtured by filth incident to human habitations, upon moisture and heat co-operating therewith, and that the first principle of its limitation is to avoid these. While it is sometimes derived from persons, or conveyed by things, and thus communicable, the weight of opinion is that it at times springs up as a product amid unsanitary conditions, without a previous case or emanation therefrom.

Next, it may be said that it is not believed that diphtheria occurs frequently, if at all, from impure water, as do some of the zymotic diseases, or that it is especially conveyed by the discharges, as is believed as to cholera and typhoid fever. It is more essentially a foul air disease. It is also one of those foul air diseases which is believed especially to choose the fauces and surrounding membrane for its first display of unhealthy activity. "It thus infects the moist surfaces of the throat," and is conveyed into the lymphatics, and reaches the blood; many regard it as local, before it is constitutional in its action, and believe that protection is afforded by avoiding open inhalation through the mouth and by protecting the surface of the throat, from its sedation by astringent or antiseptic substances.

If, however, the blood is primarily or contemporaneously affected, prophylaxis now seeks to put it in a condition unfriendly to the setting up of the disease process. Barker speaks

of the anti-hyogenic effect of quinine. Laudor Brunton in his late work on "pharmacology and therapeutics" says "facts all seem to point to ferments or enzymes as the agents by which the tissues are built up or pulled down." * * The action of drugs upon these is becoming one of the most interesting questions in pharmacology."

It is claimed by many that "diphtherite" as a process is a factor in many diseases and that what we call "diphtheria" is only distinct in that it manifests itself so primarily as to give this specific name. Thus Martin, of Berlin, after defining the diphtheritic process as consisting of a "fungous formation the spores of which are seen under the microscope to penetrate not only into the tissues but within the blood vessels producing in the way a generalized disease," claims that even in puerperal fever this is the predominating element. Diphtheritic deposits have been long recognized as occurring in scarlet fever, measles, etc. It is not certain but that we are to study classes of disease and their allied traits much as the botonist does plants—which, although quite different, yet admit of association and of explanations even when great variations of type or hybridisms occur. Diphtheria as less often traceable to antecedent cases, as well defined in its prominent symptons and as traceable in some of its blood and tissue changes, may well form the nucleus for close study into the etiology and prevention of zymotic diseases. Cleanliness, avoidance of all putrefactive decompositions, attention to the mould or fungoid producing moisture of foul air and foul water in buildings and preventive treatment of individuals are capable of greatly diminishing this insidious disease.

LOCAL EPIDEMICS, ETC.

In the enteric or typhoid fever at Princeton, the periodic and other malarial troubles of Bound Brook, and the small-pox of Camden, we have this year had three typical and impressive reminders of the evils that can result from avoidable diseases.

The mournfulness of death in educational institutions among those in the vigor and promise of early manhood; the depression of an entire population, and much suffering among the laboring classes, and the excitement of a loathsome contagion have each

in their way shown how melancholy and how pecuniarily unprofitable are the self-imposed burdens of avoidable sickness.

As the sickness at Princeton is made the subject of a separate paper we need not enlarge upon it here.

PERIODIC FEVERS OR "MALARIA."

In our last report, pages 18—25, under the division of Miasmatic Diseases, we gave special attention to that prevalent form of disease, whose periodicity is most distinctly declared in the form of "chills and fever."

It is unfortunate that the terms malaria and miasm, as frequently used, do not convey any distinct idea of the disease thus sought to be designated. In the nomenclature of the Royal College of Physicians, London, as reproduced in the United States Government publication, of the "Nomenclature of Diseases," which has been accepted thus far as the basis of our nosology, the term "Miasm" does not occur, and the term "Malarious," only as a definition of "Remittent Fever," a fever characterized by irregular repeated exacerbations, the remissions being less distinct in proportion to the intensity of the fever.

In the classification of the Registrar General of England, under the class of zymotic diseases miasmatic diseases are named as Order 1st. Under the order are associated nineteen diseases, the last being left indefinite under the title of "Other Zymotic Diseases." Ague and remittent fever appear as 16th and 17th in the list. In this classification miasmatic is used as the name of an order in its etymological and general sense, as meaning "a noxious particle or substance or exhalation floating in the air," which has become a cause of disease. Physicians when rightly using the term "malaria" do not use it in its derivative sense as a term for foul air in general, but as denoting "an exhalation from marshy districts producing fever or disease of an intermittent or remittent type." "It is believed to be the product of organic decomposition in soils," in which heat and moisture are important factors. From the fact that it seems to be generated in the greatest amount in marshes containing vegetable organic matter undergoing disturbed or uncompensated decomposition, it is often called marsh miasm.

While the term "miasmatic" may be employed to denote all

the forms of "foul air" or "infective particle" diseases, the term "malaria" should never be used in the lax sense it is by the laity and by too many physicians. If it is to mean anything distinctive and descriptive it must be confined to the class of diseases to which we have referred. There is increasing evidence that this malaria produces its own specific effects, and that to a great degree its production is due to causes which are within the range and the duty of human control.

Nature has its own processes of decay and its own compensations, so that the undisturbed great Dismal Swamp of Virginia, for instance, is not known as a cause of malaria. But when art substitutes something else for the exuberant vegetation of nature, or impedes natural water courses, or adds to the products of decay, or disarranges the relations of heat and moisture thereto or in any other way introduces its own methods, we must see to it that we provide for the changed conditions. It is now well understood how decomposition, the level of ground water and the heat of the ground, can be affected by artificial methods, how, where there cannot be immediate relief, we may prevent exposure and how we may fortify the system against attack.

It is fast coming to be understood by our leading students of social science, how neglect or remedy of evils that affect public health bear on the financial prosperity and general condition of the people. Much more is now known as needing to be done than is executed. The causes are abatable, although sometimes difficult of abatement. The time is not far distant when land and water rights and privileges will need to be guarded in the interests of public health, for the public good, just as property is taken for railroad and other improvements. While the strict forms of law and adherence to public rights must ever be recognized, regard for the general health must be held equal to that exercised for other material interests.

Never, more than in the last year, has evidence come to the Board, that malaria is dependent on local causes, which to a great degree admit of abatement. The mildness of the last winter, and the unusual heat and dryness of the spring months seem to have stirred into unusual activity the processes of vegetable decomposition, and so in many places to have added to the prevalent sickness.

Various localities in the State have given new evidence of a

continuation of unhealthy emanations long since realized. We have no experience not common to parts of other States except that our rapid growth, our centralization in towns and our many works of public improvement, cause more disturbance of natural conditions. Cities like Camden and Burlington have been greatly relieved as to malarial tendencies by improvements in drainage, while other cities have increased rather than diminished their impediments to a dry and cleanly soil.

Ewing township, in Union county, appealed to us in a case which seems plain. An unimportant saw mill site is the cause of the inundation of a considerable section in the township. On an appeal made to us by the Board of Health of that township we made careful examination of the district and also secured facts in detail as to the sickness and its localities. These were furnished with great precision and with corroborative evidence. At a meeting of the Township Board, held in Trenton, full conference was held with the Secretary as to the means to be used for relief. It is recognized that some defects exist in our laws as to the securement of drainage for health, and is believed that where clear evidence is afforded of prevalent damage in this respect the law should provide means of relief.

The following is part of a letter received about the same time from the Cashier of the Bank of New York, resident at Belleville:

NEW YORK, July 23, 1880.

A. W. ROGERS, M. D.,

President of the State Medical Society.

Dear Sir:—Having lived for several years at Belleville, and suffered from malaria in my own family, I have been led to observe the influences which produce or aid in the dissemination of malaria, and I have observed that the prevalence of diseases of that nature, (to a large extent), depends on the condition of the water in the various mill or factory ponds. And I have observed that the drawing down or emptying of the ponds for repairs to dam or other purpose, during the summer time, has been followed by a wave of chills and fever or typhoid. Last season the old Birds' mill pond, (you may know it), was drained during the hot weather, that the Newark Aqueduct Board might lay their pipes across. Immediately after, the lower Hendricks pond was partly emptied to repair the Montclair Railway bridge; the effect was evident in increase and spread of malarial

disorders. Two years before, the upper Hendricks pond was emptied and the locality of Montgomery was a prey to malaria. There is no doubt in my mind that the improper use of the water-courses and ponds is largely the cause of the reputation of New Jersey for malaria &c., and it does seem to me that it is a proper subject for legislation.

BOUND BROOK.

The condition of the beautiful village of Bound Brook has become so well known, that we are in no danger of injuring its best interests, by speaking plainly of its deplorable experience. About July 27th, we received the following note from one of its physicians:

EZRA M. HUNT, M. D., METUCHEN, N. J.

My Dear Doctor:—Bound Brook is certainly in a very unhealthy condition. On Main street there is but *one house* which escapes from malaria in some form—and this is simply a fair sample of the whole town. Chills are frequent—fearful neuralgia more so—but the fever predominates. The street on which I reside, the best drained and located on a small hill, I do not believe one man, woman or child escapes, except by leaving town. When I say I believe, I mean I have been unable to find a single exception to the statement. Now my object is to see if I cannot persuade you to visit this place, show you its plague spots and see what can be done for it.

Respectfully yours, &c.,

C. M. FIELD, M. D.

BOUND BROOK, N. J.

A visit the subsequent day and a careful examination, not only of the one chief marsh, but of all surroundings convinced us that there were local causes of disease of the most serious character. Changes caused by the alterations of roads, building of railroads, gradual obstruction of water-courses and the accumulation of decayed and decaying vegetation had attracted attention before. The previous summer, the increase of intermittents and remittents had been so great that complaint had been made before the grand jury, and before the sickness of this summer, an indictment of the chief marsh as a nuisance, had been made.

Not long after our first visit, the State Board of Health was asked to be informally present at a meeting of the Township

Board of Health and of the citizens, held for the purpose of producing evidence that might satisfy the Township Board that this marsh needed to be reported by them as a nuisance. Although it was not necessary that our Board should formally meet, and as at this stage of proceedings it had only an advisory and individual relation, three or four members of the Board were present.

The proceedings were conducted in a deliberative way and full opportunity afforded to get at the facts as to the prevailing sickness and as to its causes.

Every physician of the town testified to the due extent of the evil and agreed as to its causes. The most prominent citizens declared that unless there was an abatement of the evil, property interests could not induce them to remain as residents.

Whole families of laboring men prostrated, business paralyzed, all that could get away seeking relief by flight, and a kind of testimony irresistible, both as to the facts in evidence and the character of those offering it, made out a case of malarial poisoning so oppressive and universal, as to furnish such a typical example of concentrated malarial poison and of its saturating effects as deserves to form a whole chapter in the future history of periodic fevers, due to localized and artificial causes. Gen. Viele, after a careful inspection of the whole precinct, declared it to be the worst exhibit of a malarial manufactory that he had ever witnessed, and worse than anything known this side of Africa. Assertions that had seemed to us extravagant were fully verified by what we saw and heard, so that I believe every member of the Board felt fully convinced of the severity of the visitation and the reality of its alleged exciting causes. Even in July, all through the pond, there were patches of dead vegetation, not even the water lily being able to withstand the alternations. The mild winter, the heat of early spring, the alternation of water and of exposure of the bottom of the marsh, with its decaying mass, to the action of hot suns, made an effluvium so sensible at nights, and often in days of humid atmosphere, as to be fully certified by the community at large. It was a "macerating reservoir of vegetable substances, causing those pestiferous exhalations to which intermittents in all their grades and varieties have been cbviously traceable." While no doubt other evils exist, this marsh and its tributaries

were the chief cause. While this does not inculpate the present owners, since they do not seem intentionally to have created the evil, yet it did show that the equity of law should somehow reach the evil before another summer comes.

The local Board of Health, under the act of March 12th, 1880, declared the mill-dam a nuisance, and ordered its removal in November. In the meantime, a second complaint was made before the grand jury of Somerset county, and a true bill found. The case came up for trial at the fall term and occupied the court at Somerville for ten days. It will ever be a notable trial in the history of New Jersey sanitary legislation. The owners of the land made a most vigorous defence, with the aid of some of the ablest counsel of the State. The Prosecutors showed a universality of sickness such as we believe has never been exhibited in any such trial. No person of the vicinity could be found to testify exemption. On the former trial it was shown that one man had not been sick, and that an old man and his wife, who usually retired soon after sunset, had escaped. On the second trial it appeared that these three had since all been down with remittent or intermittent fever. Attempt was made to show that the malaria at Bound Brook was a part of the general prevalence of this malady; that there were other operative causes; that the water of the pond was not harmful, but that the wells might be. The verdict of the jury sustained the indictment of the grand jury. The case fully shows that law must in such flagrant cases protect the health of the citizen, and that even ownership in real estate is not so precious as the lives of the people. As it is desirable that no private property should be confiscated without award, and also that it should not become a public nuisance, we submit, that drainage for health should be recognized in the State of New Jersey. The law does not hesitate to provide for drainage of land for benefits to agriculture, or to condemn one's private property when it is wanted to build a railroad, or to widen its tracks. This is right. But it is also right that under the same restrictions, or the same provisions for equitable appraisement, mill-dams or marsh lands, which are notably unhealthy, should admit of similar condemnation, under provisions fair alike to owners and to the general public. Surely the public interest requires that whole communities should not be prostrated as a result of such

artificial marshes as that which fully suspended the prosperity of this growing town.

The defendant was directed to abate not only the mill-dam, but to remove all the obstruction that had caused the nuisance. And it is being promptly abated. The details of the trial, the evidence, the pleadings, and the charge of the Judge, are worthy of permanent record.

There is very great need, in many localities in this State, of drainage for health, and there is need of such legislation as, while it guards personal rights, should make it as possible in behalf of the public health for the Supreme Court to condemn land for this, as it is for other public interests.

Extracts from the reports of local Boards of Health will indicate various localities where "malarial" diseases have occurred. While climatic conditions have favored so wide-spread a prevalence, it will be found that many localities have been exempt, and that those regions have suffered most which have long been recognized as in the vicinity of unhealthy swamps or low grounds, filled with vegetable refuse.

We also call attention to one of the reports from a local Board, of a peculiar endemic fever which occurred near Blackwoodtown, and is believed to have been caused by putrefactive composts, brought there for fertilizing purposes.

See reports of local Boards.

THE ELIZABETH NUISANCE.

Early in the year our attention was directed to a nuisance that existed between Elizabeth and Elizabethport, in the case of an establishment for the recovery of sulphuric acid from the refuse liquors left in the refining of kerosene oil.

In the separation of the kerosene much sulphuric acid is used. The thick liquid left consists of various nauseous hydrocarbons or complex oils, in connection with the sulphuric acid. The whole is known as "sludge." This was brought to a dock and transferred to vats and retorts, and by a crude process and by imperfectly conducted works the acid was separated. The result was that the fumes of sulphuric acid and a floating vapor, composed of various of these petroleum compounds, was diffused a great distance. In certain states of the atmosphere it

did not seem to mingle with the air, but to be carried along through it as if a distinct and unmingling substance. Recently an author has attempted to show that the reason of the heavy fogs of London is partly to be found in the fact that the similar atoms given off from various factories become coated with an oily pellicle and so are prevented from oxidation and from ready mingling with the atmosphere. Whatever may be the reason it is certain that some vapors do not readily submit to atmospheric dilution and are to be studied as to their resisting constituency.

At least it was certain as to this vapor that it was a great annoyance to the whole district in which the distillery works had been started. In very many, beside discomfort, it produced a sensation of oppressive breathing and nausea, and it was claimed that in others it caused headache, diarrhœa and other serious sickness. There was the usual difference of view as to whether it was absolutely harmful, and at one time it seemed as if a long litigation would ensue on the point whether it was a nuisance injurious to public health.

Although the present English law, in its definition of a nuisance injurious to health, includes such permanent odors as unpleasantly affect large masses of people, and are found to nauseate or distress large numbers of persons, yet our own courts have heretofore been exact in their requirements as to proofs of actual evil effects to the human system.

But the case in hand illustrates the present tendency to pay due regard to the public health, to consider all alleged interferences therewith. Public opinion was earnest and outspoken in condemnation of the evil. The physicians of the district very unanimously expressed their opinion that the vapor was unfavorable to health. The Secretary of the State Board of Health was requested to make a full examination of the works and an inquiry into the effects, and of the vapor.

At the same time an indictment was sought from the grand jury, and an injunction from the higher court. The case was fully presented and finally an indictment secured.

The Chancellor also appointed an expert commission for the purpose of examining into the alleged nuisance, its effects on public health, and whether it could be remedied so as to permit the continuation of the works. The result of the examination

was such as to satisfy them of the imperfection of method and the evils arising therefrom.

The owners are experimenting on methods, in order to satisfy the committee of experts. The nuisance will be abated. The case seemed to illustrate three or four important points:

I. The power of intelligent public opinion, when it is freely expressed, is persistent and adapts right methods for the accomplishment of its object. Much failure in removing nuisances that is attributed to the imperfection of law, is due to a defective public opinion, a feeble or defective expression of it or a resort to methods which are unwise and indefensible.

II. The tendency of law to conserve the interests of public health. The case was acknowledged to be one difficult of proof by the closest tests of chemical analysis, or by testimony as to the effects of such vapors in dilution. But the exact testimony of personal experience was found to be definite enough to overcome all this. Although some of the decisions of courts, several years since, seemed discouraging as to the definition and abatement of nuisances, it is evident that now both public opinion and law incline to regard the protection of the public health as a frequent and definite duty of the State. The Attorney General in his opinion on a law passed by the last Legislature and referred to him for direction as to one of its clauses, after giving a construction thereto, governed by the intent rather than the technical wording, says: "If the law was not a sanitary measure, it might be questionable whether it would bear such a construction." The same spirit is manifested in both State decisions and municipal ordinances. Law is both being made and executed which, while regarding private rights, recognizes the fact that the health of the people is a supreme law.

III. It showed how crude and imperfect are many of the processes now carried on to the discomfort of the public.

The so-called factory was little more than a series of vats and retorts placed out of doors, with only a shed over them, in which not the least attempt was made to absorb or burn nauseous emanations, or to conduct a chemical process with some regard to public comfort. This was not because the evil did not permit of remedy, or, at least, of abatement, to a large degree, but because the parties did not know of the best methods, or did not care to incur the additional expense. The Local

Government Board of England has recently, through Dr. Ballard, made a most able and elaborate report as to the best method of conducting those manufacturing or chemical processes, which are apt to cause nuisance. It has been shown that these trade-occupations now admit of clear and safe conduct, and that evils arise chiefly from defects of apparatus or supervision. Already our chief routes to New York City are tainted with questionable smells, and the refuse factories which are driven from the cities of other States, find refuge within our limits. We must insist upon it, either that such establishments are not placed in our midst, or that they be conducted according to the methods consistent with our proper comfort and health.

IV. The vapor and odors from this factory illustrate how, notwithstanding the true doctrine of the diffusion of gases and the power of the air as an oxidizer or deodorent, there yet may be circumstances in which mists, vapors or organic particles may be carried unchanged for long distances and be capable of exercising their own peculiar influences. It is known that the odorous particles from this factory were at times recognizable several miles distant. After having heard statements as to its recognition at Cranford and at the docks at Perth Amboy, we had a still more convincing experience. Three weeks after my own visit to the works, on a day when the wind was east, with the damp, sleety atmosphere of an approaching snow-storm, I perceived the odor distinctly on an inland road between two woods, a distance of twelve miles from the spot. On this occasion and at two subsequent times, in similar condition of wind and moisture, it was distinctly perceived by several at a distance of eleven miles, and the odors described by those who did not know from whence it came. There is accumulating evidence that in certain conditions of atmosphere waves of vapor may move in invisible strata for distances much greater than once conceived. It is not improbable that when a contagion has become greatly multiplied in one spot, it may thus be raised and float away from its own district, and carry its infective particles long distances and affect only those that come within its zone.

SMALL-POX IN CAMDEN.

About the middle of July information reached us through private sources that there were some cases of small-pox in Camden. An official inquiry, addressed to us by the National Board of Health, with information received by them, led me, on July 28th, to address to the Sanitary Committee of that city, a letter as to facts known to the Board, as to the need of more active measures in reference to this disease, and of more active exercise of sanitary police in general. The letter was kindly received by the Common Council, and referred to its Sanitary Committee. Other communications from private citizens, induced me soon after, to visit in person the City Clerk, of Camden, as the city official with whom the Board has official relations. We obtained from him such facts as made us urge upon him at once to communicate with the sanitary authorities, some of whom were absent from the city. August 16th, I received a communication from James H. Wroth, City Physician, asking me, on behalf of the State Board of Health, to meet the Sanitary Committee at my earliest convenience. I telegraphed for a meeting the next day.

It proved to be a conference with the Sanitary Committee of the Council, and with several of the leading physicians and citizens. We spent the afternoon in a thorough inquiry into the facts as to the spread of the disease, and its localities. It was admitted to be on the increase each day, and also that adequate means had not been devised for its check. Without undue criticism of the fact, it was the accepted view that all should, with rapid promptness, co-operate in the adoption of those means which were advised. August 22d, our Board received the gratifying evidence that very active measures had been already taken, that new supplies of vaccine virus had been secured, that a system of isolation and vaccination was being followed with satisfactory results. Reports to the Board showed thirty-eight cases in the hospital, sixty cases in the city, and many persons exposed. The conference was otherwise valuable as directing attention to various other defects in sanitary administration, and in securing the initiation by the sanitary committee and others of a plan for more effective sanitary care.

Small-pox is so far a preventable disease that we need not

here report the thousand statements and arguments already in print as to the means of isolation of every occurrent case, and of such vaccination as will deprive the disease of material for attack. Clearing up the rear yard and using disinfectents is very good as a general cleanliness and is primary in case of some epidemics, but isolate and vaccinate are the primary things to do in impending small-pox. By our present methods about every seven years we raise a population so unprotected through neglect of vaccination as to give sure and hardy soil for fertilizing and propagating this disease. So long as we pursue this plan, we shall continue to have, every ten years, pecuniary losses (not to speak of lives) from small-pox, more than equivalent to what it would cost to vaccinate gratis the entire growing population.

Now that bovine virus is so easily procured and those who fear contamination from other people's children may be vaccinated from safe sources, there can be no possible excuse for an epidemic of small-pox. It is a reproach to our civilization, an evidence of a corrupted taste for eruptions and disfigurements, an ensign of carelessness, or a proof of original sin too actual for argument.

While other methods than those of compulsory vaccination may be expedient, yet our laws should go far enough to restrain those who by their neglect endanger society, from attendance on public schools, from leaving houses that are infected, or from exposures of the life and health of others until such time as vaccination has been performed or the danger has ceased.

KEROSENE EXPLOSIVES.

In the second report of this Board, pages 16–22, attention was drawn to the dangers to life resulting from illuminating oils. In view of the facts in evidence, it was claimed that some legislation is needed on the subject.

Last winter a bill was presented, which, while it sought to secure regulation, was not, in all its parts, such as the Board could have approved. The need of exact legal enactment as to the subject, is being made more and more apparent by the frequency of accidents. These oils are more largely used each year, as we find by the statements of dealers in cities where gas

can be had. Their use necessarily falls under the charge of those who are not always intelligent or careful. Some of the accidents occur in the designed use of the oils. Others result from attempts to fill burning lamps or to light fires. While this use is to be censured, yet many of the accidents that occur in such cases would not take place were the oil of standard purity. During the last year we have heard of an unusual number of these accidents, and have reason to believe that the sale of low grade oils is increasing. It is to be remembered that such oils, especially in summer, give off gases which mixed with common air are highly inflammable. Many a half full can or lamp or a partly filled barrel has this volatile and inflammable gaseous mixture floating above the surface. It is not merely formed by the light approaching, but is there ready to explode if the light or fire happens to be brought in contact.

The following case which has come under our examination this year, will illustrate:

A girl of twelve years, living in the township of Raritan, toward Perth Amboy, was left with a sick friend alone in the house, on a very warm May day. The fire was probably supposed to be out, but a few embers must have been beneath the wood she attempted to light. The can exploded and set her clothing on fire. The top was on, showing that she had only attempted to pour from the very small spout. She ran out of doors in a strong wind, and in five minutes fell on the grass, and was dead before the farmer in the field could reach her.

On visiting the house, we found that the top of the can had been so violently separated as to leave the full mark of its rim on the ceiling, and so as to cut through deep into the brown plaster. Many spots of oil had been thrown here and there over the entire kitchen. A small amount of gunpowder could not have shown greater explosive power. On inquiry we found that the quart can had in it scarcely enough oil to fill a lamp—was in a warm closet, about fifteen feet from the stove. It was evident that the can always contained the explosive gases ready to set on fire the oil or anything that came within reach. Tracing the oil to the vendor we found it had been bought and sold by him as one hundred and twelve degrees test oil and was very largely in the market in most of the towns. It was tested May 17th by Prof. A. B. Cornwall, of Princeton, and he wrote as follows:

"The sample of kerosene you left me I have tested to-day. It flashes at eighty-eight degrees Fahrenheit, and burns (fire test) at one hundred and seven degrees Fahrenheit. The tests were made in a Tagliabue's open tester, with a thermometer by Tagliabue, specially made for such tests, and showing single degrees. A preliminary test was first made and the oil was again tested, raising the temperature uniformly from seventy-three degrees to eighty-eight degrees in twenty-four minutes, and from eighty-eight degrees to one hundred and seven degrees in eighteen minutes more. The oil is unsafe."

On writing to the wholesale dealer in Newark, we received the following:

NEWARK, N. J., May 19th, 1880.

Mr. E. M. Hunt, Metuchen:

DEAR SIR:—Yours of the 18th received. We were not aware that we were putting out oil at less test than branded. The oil is shipped for us from Philadelphia, and guaranteed to us to stand a test of one hundred and twelve degrees, and we guarantee to our customers this test. You will find on one of the heads of the barrel the State of Pennsylvania Inspector's brand, as viz:

Inspected by Charles F. Miller. Guaranteed fire-test one hundred and twelve degrees, Philadelphia; and we supposed that the State Inspector's brand was a sufficient guarantee that the oil would stand test as branded. In regard to the accident you speak of, if one hundred and fifty degrees test-oil was poured into a *burning fire*, it would ignite and explode just the same as the one hundred and twelve degrees, and all the accidents, or ninety-nine per cent. of them, happen from the careless use of kerosene in just this manner, by pouring on the oil *after* the fire has been started; but we will give this our immediate attention and thoroughly investigate it, and call upon you at your office in a few days. Until then, we remain

Yours, &c.

On receipt of this, we again communicated with Prof. Cornwall, who not only re-affirmed his former examination, but claimed that 150° test oil poured on a fire, would not give such results as we had found in the case. Further correspondence led not only to a visit from this firm, but from the firm in Philadelphia, which had sold the article. None of these gentlemen were personally intending to sell below the standard. The one from Philadelphia frankly told me that such oil should never be put on the market, especially in summer. He even cautioned

the storekeeper against allowing it to be in the barrel on his front platform in the sun. He said that the article was largely sold at wholesale at about seven and a half cents per gallon, and that it was so nearly a bye-product, that it would not pay to adulterate it with naptha. In half full barrels, or cans, or lamps in hot days, an inflammable vapor could generally be found floating on the surface. One of the firm selling it here, after hearing what was said, filled his can with a different article. Both of these large dealers said that the better class of wholesale dealers would support a proper law, although aware that there was concerted action against legislation on the part of some prominent firms.

Our experience in this case, the information given, and other inquiries, have made us feel that it is well nigh inexcusable for our State longer to delay such restrictive and regulative legislation, as the exigences of the public safety demand. Local Health Boards in various localities are inquisitive as to their powers in reference to it. The Secretary of the Board of Health, of Washington, Warren county, instituted careful tests of the oils for sale in that town. The fifteen oils examined were none of them found even up to the "fire test," at which they were bought and sold; some of them being more dangerous than others. One of the worst was one sold as 150° fire test. The examinations made by Dr. Baird, and the conservative efforts made at correction, as detailed in the *Washington Review*, of July 2d, 1880, are well worthy of general attention. We only ask that the repeated admonitions given by accidents, which endanger and destroy life, and by the united testimony of chemists and other experts, be no longer allowed to pass unheeded.

LOCAL BOARDS OF HEALTH.

The most important sanitary progress of the past year in this State, has been the formation of about two hundred township or city Boards of Health. In many of our townships are villages like Somerville, Bound Brook, etc., which stood in great need of Health Boards. Indeed, to make the Health Boards of larger cities effective, there must also be some power of health administrated in the adjacent townships. Many of our cities were found to have only sanitary committees and no adequate pro-

vision for the mode of organizing Health Boards prescribed in their charters. Many of these, like Camden and New Brunswick, have availed themselves of the new law to organize more effective boards. The Boards organized through the State have shown four types, decided by the intelligence or executive capacity of those who constituted them, or by the conceptions of influential men as to what needed really to be done.

One and the smaller class has organized merely because the law requires it, and assumes that their township is perfectly healthy, and really needs no Board.

A second class, while not knowing of any evils, recognized that it is quite possible that such may exist, and so begins in a proper way to inquire into and study the needs of the district, or holds itself in readiness to consider questions or complaints which may arise.

A third class, knowing something of the real needs, have, in a business, systematic way, proceeded with judicious regard to public rights, which circumstances justify. It is surprising how much some such have accomplished without recourse to severe measures, and how much the public sentiment has been educated.

A fourth class would attack every public and private measure with a zeal neither according to knowledge or according to the law, and are distressed that the law does not give arbitrary power.

It was to be expected that in the start of such Boards there would be incomplete knowledge as to needs, and crude views as to methods; but a review of the whole evidence will show that as a whole these local authorities are doing, or preparing to do, effective work.

A township which at the first wrote that they needed not to organize, was among the very first to find itself invaded by a nuisance from an adjacent city so pronounced as to call for activity.

We have numerous correspondence which shows how the interest of the people has been aroused, how evils are being examined, and how much room there is to believe that the law will be salutary, as much by the information it will spread and by the evils it will prevent, as by its exercise in those cases where positive orders or legal action are required.

In many districts the first step is to secure a thorough acquaintance with the character of soil and underlying structures, with water courses natural and artificial, with obstructions to natural change or artificial aid—with the contour or topography of the district as secured by sanitary map—with well and water supply—with cellars, house drains, cesspools privy vaults, both as to their kind and proximity, and with prevailing sickness and its localities.

A brief paper in this report by the President of one of these Boards will present some outline of the feasible work to be done by such Boards. Abstracts from some of the reports received and references to their organization will give a good idea of the local interest which is being manifested. We have abundant evidence from various portions of the State, of important preparatory work in the interest of public health.

This Board has been more frequently consulted the last year than in all previous years of its existence. While only seeking to be advisory, it has a sphere of usefulness constantly enlarging, and by counsel and advice has been able to give direction to important sanitary movements.

THE NEW JERSEY SANITARY ASSOCIATION AND LOCAL ASSOCIATIONS.

The New Jersey Sanitary Association has proved itself a valuable auxiliary to the work of this Board, and aided in awakening public attention to sanitary matters. Its recent meeting, held in the city of Elizabeth, excited much attention and the papers read were of great importance. The press throughout the State has largely disseminated the information furnished.

The West Ewing Local Association is formed on the Newport plan and conducts sanitary inspections of the entire township. It has recently published a volume of its proceedings, and may well be consulted as a model of what a rural community may do in appreciation both of public health and local thrift.

The Sanitary Association of Elizabeth has been active and useful, and succeeded in awakening local attention to health matters. In several other localities we have been made aware of local voluntary organizations which are aiding in giving shape to health administration.

SANITARY MAPS AND THE HUDSON COUNTY SURVEY.

In our last report we noted the fact that arrangements had been made for a sanitary survey of those parts of Hudson county which bore relation to New York bay and harbor. This included the cities of Bayonne, Jersey City and Hoboken, and the thickly settled portions of the county adjacent. The survey was undertaken with the aid and direction of the National Board of Health. We were able to command the services of excellent engineers, and the assistance of others who had to do especially with sanitary inspection and vital statistics. The sanitary map of Speilmann & Brush, of Hoboken and Jersey City, and that of Messrs. Eddy & Carrigan, of Bayonne, are specimens of correctness and execution to which we would invite the attention of all cities. Since then, under the auspices of our Board and of the Elizabeth Sanitary Association, Ernest L. Myer, of Elizabeth, has executed a similar map with full details. We can point with pride to these three maps, as furnishing a model for the whole State, and as showing what is needed to be done in every incorporated city, town or borough. By such maps all levels can be kwnon, all underground constructions be recorded and such details, represented in a condensed or graphic way, as are essential to all future planning. For the want of just such records and outlines we have seen a local institution waste no small amount of money, and can point to cities constantly making blunders because of the absence of the necessary facts as to former work done, as to soil, gradients, etc.

In addition to the mapping, inquiries were made as to all points relating to sanitary management and specimen sanitary inspections made. It had been expected that by this time the National Board would have been able to publish the map and details, from which we could procure lithographs. It is still believed that work of such importance to the Nation, as well as to the State, will be provided for, so that the general government will place within our reach the full results. Our Board has therefore postponed the printing of the maps for this year, although they will be accessible to any cities wishing to study the plans. We publish, however, some of the details of inspection in this report, such as will give some idea of the work done and of its importance as a model.

We are also able to present in connection herewith a brief and able report on the Question of Quarantine and exterior Sanitary Defences of the New Jersey front of the Harbor of New York, kindly prepared by Dr. Elisha Harris, Secretary of the New York State Board of Health.

It is plain that there are some interests along our State front, opposite to New York City, which local care is not able to reach, and that the State in defense of its public health needs somehow to secure, better sanitary arrangements than at present exist. The crippled state of local resources delays action which ought to be taken for the protection of the people from some most flagrant and apparent sources of disease.

CONDITION OF ALMS-HOUSES—JAILS.

The State Sanitary Commission of 1866, as appointed by the law of the previous Legislature, reported as to the condition of the county and township alms-houses of the State. Some facts were then elicited which showed that their sanitary condition was too often overlooked. Some statements made as to the condition of county jails seemed to the Board to make it important to associate these in an inquiry. The Board was not able to undertake an investigation throughout the State, but thought it best to single out four or five counties as a fair indication of what might be needed in others. This work has been carefully and accurately performed and the results will appear in the paper on the subject which is a part of the report. No one can examine into the general facts as to the neglects which are apt to occur in all public institutions, where the dependent or the criminal classes are kept, without seeing that each State or each county has some provisions by which such places shall be subject to a careful examination as to their sanitary condition and the means of promoting the best interests of society, as related to the inmates. In many States this is regarded as so important as to be committed to a Board of Charities. Our inquiry has only related to those matters which bear more directly on health conditions. It is evident that in this respect there is need of more careful circumspection. Either the State Board or Local Boards of Health should so acquaint themselves with the sanitary condition of these institutions as to secure them from being sources of evil either to the surrounding or to the inmates. Just

as the report is being printed, we have had occasion to make a sanitary investigation of the Camden County Alms-house, on account of a malignant form of fever prevailing there. The details will appear in the next report; but the number of inmates and the idleness and overcrowding that occurs in the winter months, is even to the casual observer, evidence that a stricter care of all our county and township alms-houses is needed. The present deplorable condition of that institution, is only what must occur whenever the spark alights to set ablaze the extra-hazardous material which has been collected.

DRAINAGE.

In dealing with great sanitary questions we are constantly feeling how essential are proper ground conditions to the maintenance of health.

Natural water-courses are impeded and no provision made for that additional drainage which varied construction and alteration demand. This is especially true in respect to cities. Among the valuable papers of this report will be found one which presents this subject with fullness of detail, and with direct evidence as to its bearings upon the life and health of our population. We call special attention to the careful use made of some of the English tables, and to the practical methods advised for executing such sanitary work.

WATER SUPPLY.

The oft-recurring and vital question of water supply is occupying the attention of many portions of our State. Several of our larger cities have no adequate water supply. Others, while having sufficient quantity, have reasons for great misgiving as to quality. While in good seasons and for the present there may be escape from very pronounced evils, a great risk is being run. There are reductions of vital force and bowel disturbances from impure water, which shorten and destroy as many lives as does an occasional epidemic. Most of our larger cities are on tide water, and so, near the emptying places of rivers. It matters much whether a water-course is intercepted and in part appropriated as a water supply away up near its

sources, or whether it is taken as near its exit, as Newark or Jersey City. In many of our towns reliance is still placed upon well water. This answers, in the smaller villages, before any one street becomes compact; but where houses crowd each other, and the various out-door and in-door contrivances and cesspools of cities are introduced, there is no defense for the well. Its good previous reputation cannot save it when it gets into such vile company. It was for a time thought that driven wells, or wells called artesian, which go down beyond the reach of soil contamination, would be our safety. But joints or fissures in much of the underlying rock may contaminate these. Worse than all, by reason of hardness or other saline constituents, the water is seldom fit for use. The many trials about Newark and Bellville and Orange have, for the most part, proved unsatisfactory, except as furnishing a supply for machinery use. Rain water, properly stored in cisterns, often answers well, and is not liable to some of the objections urged against the rain water of the British Isles. Dr. Fox, an able medical officer of health, in his work on the "Sanitary Examinations of Water, Air and Food," places last the "waters of streams and rivulets, the majority of which contain more or less filth, and in times of heavy rains, soil and mineral debris of every description." All these water questions are worthy of the closest expert study before expensive methods of supply are adopted; but they should not be left undecided so long as to peril the growth of our cities and the health of the inhabitants. We hope ere long more fully to draw attention to the water-sheds of our State, and to the indications for supply which relate to special localities.

OUR SEASIDE RESORTS.

These need our careful attention because of their rapid growth; because so many of our citizens spend a portion of their time as residents there, and because so many take it for granted that a sandy soil will purify all that enters it and the great sea quickly carry away all that flows into its waters.

It is, however, constantly to be borne in mind that pure sand is not a good filter. We know of a case in which, on our shore, a part of a barrel of brine was emptied more than fifty feet distant from a deep tube or driven well. About three weeks

afterwards the water of the well was found to be salt, and so continued for several days. The circumstance was recalled, and there was good reason to believe that the salt had thus found its way into the deep water supply.

It is known that at many places cesspools are relied upon and found convenient because they so seldom fill. Their contents pass rapidly into the soil and may easily pollute it or render it unfit for a water supply. In these rapidly growing towns and villages it should be an axiom that cesspools, if used at all, should be made so tight that their contents will not leak into the ground, and should be emptied on a system. Since the introduction of iron piers, it may be quite feasible to have sewage boats so built that they shall receive this sewage by means of pipes and as often as necessary, carry it out from shore, beyond the possibility of deposit on the shore sand. To illustrate the crudeness of present methods of sea-side disposal, and the necessity of a more defensible system, we need only quote from the recent work of Robinson, an English Authority on Sewage Disposal:

"To avoid a nuisance the sewage must be discharged into the sea at a point, not only below low water, but where there is a well ascertained current which would carry it permanently seaward.

A point of discharge complying with these conditions cannot always be found to exist close to the town, or requires to be ascertained by careful tidal and other observations. At the outfall there should be a continuous movement seaward during the twenty-four hours, instead of an oscillating action to and fro, resulting in a return of the sewage and its disposition along the shore, not only at the outfall and in its immediate neighborhood, but also at distant places to which the tide carries. The foreshore of many watering places is being polluted in this way, and in time it will prejudicially affect them, as the knowledge that the foreshore is polluted becomes generally known.

The expenditure necessary to ensure an efficient system of sewage disposal, although it may appear heavy at first, is in the end, the truest economy.

The difficulties attending the discharge of sewage into the sea would be diminished were it not that it has a higher tempera-

ture, and a lower specific gravity than sea or river water, which causes it to rise to the surface. If it is not carried seaward quickly, part of the suspended solid impurities are deposited on the coast wherever there is still water and no tidal current, whilst the rest of the suspended, together with the dissolved impurities float on the surface, and are carried backwards and forwards by every tide, decomposing and liberating offensive gases."

This action was pointed out by Professor Stanley Jevons, in a letter to the *Times*, of December 2d, 1878, with reference to the formation of sewage mud banks in the Thames, by the discharge of sewage at the outfalls at Crossness and Barking.

He pointed out that matters which would remain suspended for many days in fresh water, would be readily precipitated in a few hours when the water is saline, and states that much of the sewage matter indeed, would, if left to itself, float in water; but in the presence of saline matter, which kills the pedetic or oscillating motion of suspended particles, cohesive attraction comes into play. The minute particles of suspended clay will then adhere to the organic sewage particles, and carry them to the bottom of the river, where they will form foul pestiferous banks of ooze.

In the same way we may explain the peculiarly unhealthy effect produced at seaside watering places, where the sewage is poured down the beach, into the sea, in front of the town, if any such there still be. Unless there be strong tidal currents the foul particles are not carried away, but are precipitated and mingled with the sand and mud of the beach.

If the salt water enters the sewers the deposit will occur therein, and we may infer that flushing the sewers with sea water, will probably do a good deal more harm than good.

In the proceedings of the Boston Society of Natural History, for February, 1874, Dr. Hunt, states: I have called attention to the fact that the clay resulting from the decay of rock remains for many days suspended in pure water, though not in waters even slightly saline, and is therefore readily precipitated in a few hours, when the turbid fresh waters mingle with those of the sea, thus forming fine argillaceous sediments.

The geological significance of this fact was, it is believed, first

pointed out in 1861, by Mr. Lidell, in Humphrey's and Abbot's "Report on the Physics and Hydraulics of the Mississippi River," (appendix A, p. xi,) where he applied it to explain the accumulations of mud at this river's mouth.

Sea water delays the oxidation of organic matters, so that the foul constituents of sewage, which in river water would be liberated and got rid of in a short time, are preserved in sea water, which causes them to accumulate and form dangerous deposits ready for .the quickening action of the summer sun, when gases, injurious to health, are evolved. It is claimed, too, that brackish water, or foul material slightly saltish, attacks the refuse matters, and liberates foul-smelling gases.

The objectionable nature of deposits from sewage is evidenced by the observations made by the late Dr. Letheby, on the mud banks that are forming in the river Thames. He describes them as being composed of black and fetid mud, in a state of active putrefactive decomposition, and when examined under the microscope, they were found to consist of broken-up sewage matter, the remains of animalcules, the disintegrated tissues of vegetables, and swarms of diatomaceous remains; and he stated that the mud and suspended matters of the river contained from 6.3 to 18.9 per cent. of the solid constituents of sewage.

To prevent the possibility of doubt the connection between the deposits in the river, and the sewage discharge from the outfalls, has been clearly traced by analyses, and the chemical correspondence between the two unmistakably established.

The same opinion is held by Dr. Frankland and Dr. Tidy as to the similarity in chemical composition between the mud banks in the Thames and the sewage of the outfalls. In some cases, by means of long outfall sewers, the sewage is carried away from the place producing it to the sea, but they are frequently simply transferring the refuse to others, a set of the tide carrying it so as to cause mischief and nuisance elsewhere.

These outfall sewers require careful ventilation as the sewer gases are otherwise liable to be forced back into the town drains at high tide, or after storms, and thus into the houses, even if the house drains are trapped from the main sewers.

A catchment pit should be placed at the outfall, and the solids deposited therein removed systematically. Even then the addi-

tion of a disinfectant and deodorant is sometimes desirable, or it may be found feasible in connection with our iron piers to have a sewage boat so constructed as daily to receive the sewage and convey it three or four miles out to sea.

It will be pleasant when our own seaside resorts attain the precision in health management now secured by most of the English watering places. It is now considered indispensible that these should be able to certify themselves to the public, as to their water supply and methods of sewage disposal, and as to the actual records of health, both of residents and non-residents for series of years. Douglas Galton, in his anniversary address before the Sanitary Institute of Great Britain, says: "A comparison of the local acts obtained by different towns, shows the progress which is continually taking place in the sanitary intelligence of the community. This is illustrated by taking only one point, viz: the registrars of disease in several towns, notably, watering places or health resorts in which self-interest is largely concerned, have obtained power in special acts of Parliament to require the compulsory registration of infectious diseases. These towns, instead of concealing real nuisances or causes of disease, found that it is better, by publicity, to subject themselves to the highest tests of salubrity, and at the same time avail themselves of the highest motives for sanitary completeness.

RESCUE OF THE DROWNING.

The fact that our vital statistics of the last year showed the loss of one hundred and ninety-three persons by drowning, and that we have so long an extent of sea-coast, led us to print in the report of last year an article on drowning. Afterward the whole subject of the rescue from asphyxia was re-studied, and a full examination made of all the plans adopted for the resuscitation of the drowned. The result was the circular issued by this Board and largely distributed throughout the State. A captain in the life-saving service on our coast made himself conversant with it, and soon had an opportunity to apply it, as thus stated: "In a case of drowning at Monmouth Beach, not long since, after various efforts had been used to resuscitate the body by those present, Captain C. H. Valentine, Superintendent of

Life Saving Station No. 4, was sent for, and restored the man by following the rules for resuscitating the drowned, as laid down by the State Board of Health, and known as the New Jersey Method. These regulations have been adopted throughout the State, and are the most serviceable of any of the methods for resuscitating the drowned." It contains two or three directions not to be found in any other plan, and insists upon the value of the electric battery and the hypodermic syringe for administering brandy and digitalis. We commend it to the careful study of all who may be called on to treat such cases. We believe all life stations and all prominent hotels should have ready at hand the pocket battery and the hypodermic syringe. The whole cost is not over ten dollars, and, in some cases, these are indispensable. No one could read the facts as to the recent loss of General Torbet without feeling that any such resuscitation at hand would have saved his life. We commend this whole subject to the attention of our citizens, not only because of the number of accidents the last summer, but because, with our rivers and lakes and great seaside resorts, there is likely to be frequent need of this kind of service. Medical aid is in vain in such cases unless there is a full knowledge of the best methods of manipulation, and a ready resort to these collateral aids when required. We believe that this circular should be in each hotel on our coast, and that local health boards should extend a knowledge of it.

REGULATION OF MEDICAL PRACTICE.

In the early history of our country, and especially in our own State, important safeguards existed in order to assure the people that those who attempted the practice either of medicine, surgery or midwifery, had received such special preparation for their work, as to assure the people that the interests of human life would be promoted by their art.

By degrees, legislative restrictions gave way to an almost unprotected laxity. Illinois was the first State to move in the direction of restoring restrictive legislation. This did not seek to discriminate in favor of any one school or sect, but only required that all who professed to exercise the healing art should be able to give such evidence of previous preparation for their

duties, as might not unduly risk the health and the life of the citizen. The law went into effect July, 1877. It was found that out of the 7,600 physicians in the State, only 3,600 were legalized practitioners. In 1880 the number of authorized practitioners had increased to 4,825, and the number of unqualified practitioners had greatly decreased. Last year an additional evil was discovered, in the sale of diplomas, and became so flagrant as to attract the attention of our National Government. Subsequent revelations leave no doubt that in addition to the multitudes of unqualified practitioners who could show no license, several thousands more have operated under bogus diplomas and still further jeopardized human life. The disposition to limitation and restriction in our State, was manifest among the people and in some of our intelligent legislators before it was among authorized medical practitioners. The latter had become so used to this kind of laxity and so displeased with successive acts of legislation which had practically deprived them of any control of the matter, that they apparently viewed it with little concern. But it became so evident that the public health was suffering from this promiscuous practice, that the last Legislature enacted a mild form of restricting law. It only seeks to assure that each person claiming to be a doctor of medicine, should have received a license from some duly authorized Medical College. The State having done this much to protect the public health, and having shown this appreciation of the relation of proper medical education to the welfare of the citizen, it behooves all regularly educated practitioners to do their part in aiding to secure the fulfillment of the law. We think that the responsibility of a carrying out and enforcement of the law, commends itself to all local medical societies of all sects. No man whose diploma will not bear scrutiny need now be allowed to practice upon the credulity of the citizens. By a record of places of graduation, the people are better able to discriminate between those colleges of any sect which are best and those which have too low a grade of requirement. This Board has felt called upon to recognize this as one of the points in which the public has been guarded against what had become a prevailing nuisance. We append to this report a copy of the circular issued in reference to it and

inclusive of the law. We counsel both the people and all local medical societies to see to it that its requirements are complied with. We hope to have ere long a completed list of all those whose names are recorded as practitioners, as we have now of all those who claim to be practitioners, in each locality and so shall be able to compare the two. The duties of this Board are now so numerous that we can scarcely do more than register the names. It must be left mostly to the people of each vicinity and to authorized medical practitioners to see that purchased diplomas and empirics are abated. The law much needs a clause by which the genuineness of copies of diplomas offered for record can be known.

THE SANITARY EXHIBIT.

The value of an exhibition of sanitary appliances, as a means of acquainting the people with the principles of their application, and with various improvements conservative of the public health has long been recognized in Great Britain. Under the auspices of the New Jersey State Fair, and with the aid of this Board, the first American exhibit was held last year at Waverly. This year the Agricultural Society erected a special building for the sanitary department. Although the display was not extensive, we think no one examined it without feeling fully repaid, and without realizing its importance. Systems of heating and ventilation, the disposal of sewage, the various forms of household contrivances and other sanitary subjects were illustrated. We invite to it the attention of all citizens, and hope as a Board to join with others in promoting so great an interest. It will be our plan to have on hand for exhibit some of the latest improvements from the sanitary museum we are seeking to establish at Trenton, and also each year to secure from dealers and inventors their most approved appliances.

METEOROLOGY AND CLIMATOLOGY.

"Meteorology properly embraces the study of atmospheric phenomena resulting in connection with the physical properties and conformation of the earth, in what we call climate and weather." We, therefore, in its bearing on public health, study

meteorology only in its bearing in climatology. It is important to make precise records of atmospheric and atomic conditions as expressed in air, earth and water, in darkness and sunshine, in rain and snow, in frost and ice, in wind and moisture.

Having in these the elements from which weather is formed, we have the important factors which make up the climatic conditions, and so constitute the *climate*. Alongside of this, day by day, and month by month, we put the records of disease, of epidemics, of death.

It is evident that this is a department of health-study very discouraging to those who would arrive at quick conclusions. The long work of science is to collect every fact and through a sufficient number of years, so as to make the study feasible. It is encouraging that such results have been secured as enable us to predict many weather changes. Yet we still feel "that the time for the deductive treatment of weather problems has not yet arrived." The relations of weather and disease are still more complex and introduce a study as difficult as it is important. Outlines are already studied with advantage, but close deduction is still much in the future. Our Board at present only seeks to put accurately on record the chief facts as to weather conditions, in order that these comparisons may be made whenever sufficient facts are secured.

We, this year, are favored with the record of Hon. Wm. Whitehead since 1838, and thus supplement the record made by him at the time of the publication of the Geology of New Jersey in 1868. We are also perfecting records at Princeton, Newton and Vineland. New York and Philadelphia will represent other points in our State, and the records of the Signal Service are also of value. We hope thus to put on record several facts as to the weather, which will furnish the data for comparisons with prevalent diseases. The climate of the State is well worthy of the closest study in its bearing on health and disease. It has far more than usual varieties. Within our own borders, we believe, will yet be found nooks and districts which will show a record equal to the purity of the Adirondacks, and to the equability of Aiken. It may yet be that the consumptive will, on the basis of weather records, be able to stop short of Florida, and the seeker of a summer resort, not only on our ocean front, but amid our pines or high up in the northern hills, be able to show both

by records of instruments of physicians and by the experience of invalids, a climate as desirable as any to be found in the States. Some special weather conditions of the year are noted elsewhere.

It is constantly apparent that diseases are greatly affected by what we term the climate and the weather. "They are concerned, says Russell, in seasonal variations, in the prevalence of disease; in regional variations of disease; in the circumstances which at one time and in one place give wings, so to speak, to the contagion, and at other places and at other times obstruct their progress. We must recognize these facts if we wish to avoid the risk of falling into erroneous assertion of success for preventive measures, and also to justify at times what might seem undue confidence or undue anxiety as to the probable course of some disease where contagia is dominated in its activities by those cosmical conditions." * * * The seasons bring their special tendencies to disease. Temperature, and rain fall and hydrometric and electric phenomena are attended by proclivities to some diseases, while they are hostile to others. Were these the only controlling agencies, as we can not control the weather, we would only study how to modify its effects or protect ourselves therefrom. But as these climatic conditions only act upon materials already in existence so far as contagions are concerned, we seek to suspend or diminish these even though we can not operate with good success upon things celestial. Our inability to control these climatic conditions is no more a reason for neglecting to study the source and causes of contagion, than it would be for the farmer to neglect all the details of preparing ground and sowing and caring for the seed because he could not know all about the weather and the coming season.

DISEASES OF ANIMALS.

An inquiry into the diseases of animals has always been a part of the duties of this Board. It has close relations to the public health, because of the flesh and milk consumed, because some diseases of animals are communicated to or affect mankind, and because through their comparative study we get light upon the nature, causes and prevention of some human diseases.

By an act of the last Legislature the care of the contagious

diseases of animals was committed to this Board, with special reference to contagious pleuro-pneumonia which had existed the previous year in the State. The fact that at the close of the service of a temporary bureau of the previous year, 110 herds of cattle were in quarantine, made it necessary promptly to examine into the disease as it had existed or did still exist in these herds. A full inquiry and investigation showed that any disease that had existed in these herds had nearly ceased.

Active measures were at once taken by this Board to keep apprised of any new outbreaks in these localities or elsewhere, and circulars largely distributed to aid both in the identification and prompt report of cases. It has been a year of heavy loss of cattle by reason of fire, drought and sickness, and so, many cases came under our inspection for examination which were found suffering from other causes. The chief localities of the disease have been in one township of Union and Camden county, and in some of the townships about Mt. Holly, in Burlington county.

The disease has needed very careful guarding, and in several herds in the latter county has been difficult to control. Some animals died in each of these counties, and many more were slaughtered. It has been a large burden and anxiety to this Board, but the results have been fully as satisfactory as we could have expected. We have been greatly aided by the Pennsylvania authorities. The disease still needs watchful care. The full minutes as to it, will be found, as required by law, in the Report of the State Board of Agriculture.

The collateral interests of the disease are such in respect to public health, that an article on Pleuro-Pneumonia is embodied in this Report, together with some circulars relating thereto. The whole subject is worthy of the careful attention of all of our citizens, for the terms of the disease have not been magnified. With the single exception of a difference of opinion as to the construction of a clause of the law, which was amicably settled by reference to the Attorney-General, the co-operation given us by the farmers has been complete, and we owe much to their appreciation and aid. William E. Miller, D. V. S., of Camden, J. K. Dyer, D. V. S., of Mt. Holly, and J. A. McLaughlin, D. V. S., of Jersey City, have faithfully served the Board as Inspectors, and we are indebted to other veterinarians for information and assistance.

A few cases of glanders have occurred in the State. Of these, some were disposed of without compensation by the consent of the owner. In two instances payment was made by the Board. Pneumo-Enteretis, or hog *cholera*, as it is popularly, but erroneously called, has prevailed in a portion of Warren county. Although a contagious and destructive disease, about which the farmers need information, it does not at present threaten to spread. The excellent treatise of the National Government as to it, has been furnished by us in all infected localities.

Fowl-cholera, splenic fever, anthrax and tuberculosis, and the various other comparative studies, both with reference to diseases and pathological changes in flesh and secretions resulting from disease, can not be overlooked by those who are concerned either in the art of preventing or healing disease. The recent remarkable investigations of Pasteur, Touissant, Koch, Greenfield and Fleming, as to the causes of fowl cholera which is not a cholera, but a virulent blood poison, attended with swelling of the cervical glands and dnodenal inflammation, has recently been discovered by Pasteur to be capable of prevention by a "vaccine" method, and the discovery may lead to similar method, through a large range of animal diseases.

An epizootic, similar to that which occurred in 1872–3, has prevailed among horses during the fall of 1880. It had a similar direction of movement, and similar symptoms, but was not attended with so large a mortality. The climatic conditions were more favorable than during the former epidemic. There is evidence to show that at the same time a similar influenza prevailed among men. In some cases it almost seemed to have been communicated from horses.

MILK SUPPLY.

A bill referring to the sale and adulteration of milk, was quite informally placed under the oversight of Board. A competent inspector was placed in charge of its execution. He has done all that the bill would permit, and has accomplished something in guarding the public health. It is essential that some alterations be made in it if it is to be effective for the purposes designed. The law and circulars as issued are appended to the report. The article of Dr. William K. Newton, the inspector, on milk supply contains important information, and may help to guide us to future legislation.

PAPERS, SCHEDULES AND MAPS

RELATING TO SURVEY OF PARTS OF HUDSON COUNTY.

REPORT OF SANITARY SURVEY AND INSPECTION OF PARTS OF HUDSON COUNTY, AS DIRECTED BY THE NATIONAL BOARD OF HEALTH, UNDER THE SUPERVISION OF THE NEW JERSEY STATE BOARD OF HEALTH.

BY MESSRS. SPIELMANN & BRUSH, HOBOKEN, N. J.

GENTLEMEN:—In the discharge of the duties assigned us, we have the honor to make to you the following report as embodying suggestions with reference to such questions contained under schedules "F," "H," "K," "L" and "M," as seemed to us most important and as needing your attention to be directed to them. We will confine ourselves, in our remarks, to the questions as far as they concern Hoboken, West Hoboken, Weehauken, town of Union and township of Union, the remainder of the inspection having been apportioned to the other gentlemen composing the committee. We have already in our answers, in many instances, embodied suggestions which, in themselves, virtually form the basis of a report. But in order to call more special attention to the most important items, we will take them up in regular order, and point out what, to us, has seemed the most important particulars in which the sanitary condition of these places might be improved.

In carefully reading over the questions and answers to them under schedule "F," we find our attention directed to question 14: "Are the cellars and basements in any part of the city damp or insufficiently drained? If so specify." Under schedule "F," question 17: "What proportion of the area of the city is

not sewered ?" We find that about one-half of Hoboken, or about three hundred and sixty acres, is not sewered at all. Besides not being sewered, it must be borne in mind that this portion is mostly meadow or swamp land, about two feet below high tide. As a natural consequence, it is constantly saturated and covered with water, which, being mostly stagnant and poisoned by the addition of sewage matter from privies, refuse and garbage from houses and animal secretions, becomes very foul, and pollutes the atmosphere in the entire neighborhood, thus rendering it unfit to be breathed.

The extent of the prevalence of these gases during the warm season may be realized when we consider the fact that the paint on the outside of dwellings, in the worst neighborhood, has become decomposed and rendered of that bluish tinge which the interior of outhouses frequently assumes. Consequently, not only are the cellars and basements in this portion of Hoboken insufficiently drained, but practically, they are not drained at all, thus leaving the cellars always moist and most of the time partially or entirely filled with water.

The detriment to health from such a lack of drainage must be apparent to all, and by reference to a report on the death rate from zymotic diseases in this part of Hoboken, read by our firm at the last annual meeting at Trenton, it will appear to have been fully twice as great during the year 1875 as in the more elevated portions of the city where proper drainage has been provided, and more attention is paid to the laws of health.

We might add a great deal to what we have already said; in fact, it is a subject upon which a great deal of interest has been concentrated lately; but will conclude with the suggestion:

That the only remedy for this grievous evil is a thorough and complete system for the drainage of the low lands by dykes, dams, sewers and pumps and such other provision as will provide for the thorough pumping out of the sewage and rain water at all times and under all circumstances. The above subject is one which has been investigated by competent engineers in this locality, and upon which plans, accompanied by full and exhaustive reports, have been prepared and submitted to the public authorities. The question remaining unsolved in the main is the one: How shall it be brought about and who shall pay for it? This we will not discuss but will leave to the persons

directly interested. We will now turn to Schedule "H," and under it to question 21—30. "In regard to use of cesspools, privy vaults and water closets and manner of constructing them and keeping them clean?" In the city of Hoboken, where sewers exist, the water closets in use in all other cities having drainage and water supply, are employed. These, although of the most approved pattern, always become objectionable when within a building, unless they are perfectly ventilated. This it is not always an easy matter to do, and provision is only seldom made for it; consequently when they are located in the interior of a building, without communicating with the outer air directly by a window, and are not ventilated by a special flue or pipe communicating with the exterior, they often become very objectionable and may give rise to disease by poisonous gases. The outhouses and privy vaults, although emptied once in several months, yet as they are located in a closely built back yard, surrounded by high walls, are not so likely to make the air in the interior of a building impure and poisonous as an illy ventilated water closet.

We would therefore conclude that the most desirable location for a water closet is entirely without a building, especially when we can have it connected with a good sewer, thus providing for its always being clean and free from the accumulation of objectionable matter. If this cannot be secured, a proper system of ventilation should be provided in every instance in which water closets are located in the interior of buildings, and especially should this be compulsory in all schools, halls, and large public buildings, for which purpose compulsory laws should be passed. Questions 7, 8, 9, under Schedule "K," "As to slaughter houses and abattoirs" have especial interest since the large abattoir and stock yards are here and constitute the chief cattle market for a large population.

It is often the case that animals are loaded, or rather packed in close cars, so that they cannot lie down, and are required to stand without either food or water for four or five days, and are then unloaded at a place of slaughter, and killed in an hour afterwards, and while laboring under an intense degree of excitement. If the consumers of beef could witness the long trains of cars loaded with cattle while being brought from the west and required to stand on sidings, often a whole day at a time, and

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hear the lowing and moaning of the poor suffering brutes for the luxuries, to them, of food and water, such a hue and cry would go up as would soon create some legislative action upon the subject. So long as that state of affairs is allowed to exist just so long must we expect to have meat wholly unfit for human consumption, go upon the market.

All diseases that are accompanied by acute febrile symptoms in the first stages, as well as those that are characterized by purulent collections which are afterwards absorbed into the circulatory system, will render the flesh unfit for human consumption, to wit: An animal being required to stand in an open car for a long time without food or drink, becomes in consequence debilitated, which renders it susceptible to contract colds, which is a common term for catarrh, whether gastric, nasal, intestinal or any other form, inflammation supervenes which often assumes a gangrenous nature; strumous diseases follow, and in consequence the system will soon become loaded with effete materials which permeate the flesh.

This condition may be present either in the first or acute or in the second or chronic stage."

Under manufactories and trades, (schedule "L,") we only need to say that there are very few manufactories in the section included in our territory, and that we took pains to visit them and inspect them carefully, with very gratifying results.

We found them in every case well provided with means for lighting and ventilating them, and the appearance of the operatives was in general very gratifying.

By reference to the answers under schedule "L," it will appear that no children of tender years are employed, but that the ages of the youngest are not generally below 13, and that the regulations governing their hours of work are reasonable. We only hope that other districts will show as favorable a result.

We now turn to the closing schedule "M," perhaps the most important. Much can be said upon the merits of the different items under the schedule, and still the fund of information could hardly be exhausted. We cannot refrain from acknowledging the uniform courtesy extended to us by all the principals visited and the spirit of interest manifested by them to co-operate with us.

By reference to question "3," under schedule "M," the plans of

the schools will show that the rooms are generally of good size and well arranged. Much trouble is experienced in securing proper ventilation. Our impression on visiting the different schools generally, was that the air was thick and impure because ventilation in most of them could be secured only by opening the windows. The teachers themselves do not seem to realize this fact as visitors coming from out doors do, because constant and continuous confinement indoors renders them less susceptible to notice the impurity, than those who have the advantage of being in the open air much. We spoke of this to many of them, and found they concurred with us in our views and admitted the difficulty.

As a remedy we would suggest that every room in a schoolhouse should have a separate ventilating flue, communicating with the outer air in order that the ventilation should become comparatively self-adjusting. The lack in this respect may be accounted for in consequence of the date of construction of many of them, which was at a time when the subject of ventilation was not so well understood, and had not attracted the attention of the public in the same degree that it now does.

We cannot close without referring to the unsatisfactory answers obtained to the questions and notes under No. 44 of this schedule.

Notwithstanding the fact that we visited many of the oldest practitioners and tried to get their views on the subject matter under this question, we found that they had not had occasion to examine into it previously, and were thus unwilling to express any opinion entering into details on the subject matter.

Physicians ought to be entrusted with this very important mission in order that when another inspection may be ordered by the National Board they may be prepared to meet it.

If private corporations find it sufficiently important to warrant them in examining their servants, who are entrusted with the care of life, in regard to color blindness, then how much more important should it be for the National Government to secure similar and even more comprehensive information with reference to the public from the institutions of learning, by means of examination conducted by the medical profession.

We close our report with the above suggestions and hope that their contents will awaken a still greater interest in the subject of sanitary engineering, especially for the important section under consideration.

REPORT OF SANITARY SURVEY AND INSPECTION OF PARTS OF HUDSON COUNTY, NEW JERSEY, AS DIRECTED BY THE NATIONAL BOARD OF HEALTH, UNDER SUPERVISION OF THE NEW JERSEY STATE BOARD OF HEALTH.

REPORT OF MESSRS. BRUSH & EDDY, OF BAYONNE, N. J.

GENTLEMEN:—In the discharge of the duties assigned us, we have the honor to make to you the following report of the sanitary survey and inspection of the city of Bayonne, New Jersey.

The city comprises the territory formerly known as that part of old Bergen township south of Morris canal. It is surrounded by water, and is bounded on the north by the Morris canal, on the east by New York Bay, on the south by the Kill von Kull, and on the west by Newark Bay; including an area of 2,560 acres; of which about 500 is salt meadow, and about 100 closely built upon. Its topography is quite similar to the neighboring metropolis—Manhattan Island.

The city was founded in 1861, and incorporated in 1869. The population in 1870 was 3,835, and the estimated population at the present time (April, 1880,) is 8,000, of these about 700 are under 5 years of age.

The site of the city is nearly level, and the original conformation has not been materially changed.

The highest elevation above sea level is 67 feet, the lowest 1 foot, and the average level of the city is 30 feet. The direction of the general surface slope of the city is southeast.

The character of the surface soil is sandy and loamy, with occasional croppings of trap rock. About 10 acres on Kill von Kull, and about 10 acres on New York Bay, is known as made land. This "made land" is not as yet built upon, but is intended for docks and warehouses.

Water Supply.—The water supply is by means of wells and cisterns.

Streets.—The usual width of the street is sixty feet, with a sidewalk one-fifth the width of the street. The sidewalks are paved with bluestone 4 feet wide. Forty-three miles of streets are unpaved, only one mile is paved, and that with Macadam pavement.

Habitations.—The dwelling houses now in the city limits number about twelve hundred; these are mostly wooden buildings, two or three stories high, and nearly all, with the exception of those located in the Fourth Ward, and at Constable Hook, and a few rows of brick and wooden buildings in the Second Ward, are detached or isolated, with sufficient clear space all around them; about one-third are inhabited by the owners, and the average occupancy of each dwelling throughout the city is seven. There are about three hundred tenement houses in the city; these are located in the Fourth Ward and at Constable Hook. The tenements, at present, if we except those at Constable Hook, are not overcrowded; but as the tendency is to erect buildings of this description in certain sections of the city, especially in the neighborhood of manufactories, (which are increasing rapidly on our water fronts,) and knowing the evils which imperil health and life, in consequence of overcrowding and bad ventilation, we think it wise, in time, that municipal regulations be enacted for the proper construction of dwellings and the prevention of overcrowding.

By reference to the survey map, we see at present constructed four and one-half miles of sewers in the city. All the dwellings along this sewer line, and where practicable a short distance off the line, have sewer connections with tight drains and traps. Most of the houses off these sewer lines, except those located near the borders or water fronts, have the laundry and waste water drainage into the gutters, and the cellars in some localities are damp, by reason of insufficient drainage.

Sewers.—The city has adopted a complete plan for sewerage, as shown on the topographical map, but as they have no power to enter private property, and as some of the streets through which the outlet sewers would pass are not open, they have resorted to the expedient of temporary outlets across the salt meadows; notably at the foot of Cottage street, where the sewer-

age of the most densely populated section is thrown into an open ditch, which has become reeking with filth, and a source of much trouble to the Health Board. We would recommend additional powers to local boards of health, to force the completion of sewers to their proper outlet.

GARBAGE AND EXCRETA:—No contract exists in the city for the removal of garbage, and the proper distribution of ashes, garbage and rubbish is becoming one of the most difficult and troublesome duties of the local Board of Health of this city. In those sections of the city adjoining farm lands and gardens, the garbage is used for compost. By some it is thrown over fences into vacant lots, to be consumed by fowls, or left to decompose. A portion of the swill and garbage is collected from house to house by persons engaged in feeding swine, but this is done in a very careless manner, with open wagons or wheelbarrows; the liquid portions leak from the rude vehicles as they pass along the streets or sidewalks, and often a considerable part is deposited on the walks or in the gutters. On the sidewalk before some of the tenement houses, the owners have placed large wooden boxes, into which is deposited all the ashes, garbage and filth accruing on the premises, but in consequence of the very irregular and imperfect manner in which they are emptied, they become worse than useless; they are allowed often to become full to overflowing, and left in this condition for days, exposed to the influence of sun and rain, their contents becoming fluid from putrefaction, leak through upon the sidewalks and into the gutters. These wooden structures are liable to become so saturated with the fluids escaping from their filthy contents, as to constitute, of themselves, a disgusting nuisance, detrimental to health. These facts suggest the necessity of adopting some temporary receptacle for garbage, constructed of a material that will not absorb fluids, and for a *regular* and *systematic* method of collecting and disposing of such house refuse; perhaps a box of proper shape and size, made of wood that has been thoroughly kyanized or saturated with carbolic acid, might be kept sufficiently disinfected to be harmless.

PRIVY VAULTS AND WELLS.—About three-fourths of the dwellings depend wholly on privy vaults, and a very few, if any, of these vaults are water tight, and no regulations exist, as to the method of construction or cleaning the same. The faulty con-

struction and bad management of these vaults will become one of the chief causes of disease in the crowded districts. Some of these vaults are in too close proximity to wells, and the waters are very liable to be contaminated by the infiltration, through the ground, of liquid material from the vaults into the wells. We would suggest the great importance of having all privy vaults water-tight, and, when possible, connected with the sewer. The vaults should be constructed in such a manner, by rear folding doors, sheds, &c., that they may be readily cleaned out. We would also suggest the importance, especially in the tenement portions of the district, of prohibiting the sinking of wells on the premises, and that at proper intervals or distances on the sidewalk wells be sunk, from which water may be drawn, for drinking and culinary purposes, by means of the "old tea water pump."

Gas.—The gas works, and the quality of gas furnished, are satisfactory on all points.

Markets and Slaughter Houses.—There are no public markets or slaughter houses in the city limits. The tradesmen, and many of the inhabitants, obtain their supply of meats and vegetables mostly from New York City.

Milk Supply.—The quality of the milk supplied is very good.

Public School Buildings.—There are five (5) substantial brick public school buildings in the city. They are all detached, with plenty of ground and air space around, and will compare favorably, as regards location, construction, grade and course of studies, with any in the State. We append to the report the floor plan of each school, and copies of the Manual of the Board of Education.

Manufactories and Trades.—The manufacturing establishments in the city at present are mostly located at Constable Hook, on Kill von Kull, viz: Raynold's Color Works; Osgood & Co.'s Zinc and Acid Works; White's Sulphur Works; Standard Oil Company Refinery; Sea Board Refinery, and Kalbfleisch's Sons Chemical Works.

As the tendency is to an increase of manufactories of various kinds on the water fronts, proper restrictions should be imposed, to prevent the escape of noxious gases or vapors into the external air; for no business, detrimental to the public health, that posi-

tively neglects to adopt the well-known remedies that will perfectly remove all cause of complaint, should be tolerated in a civilized community.

FILLING IN OF WATER FRONTS.—As the filling of the shallow waters of the adjacent bays is becoming an enterprise of the immediate future, we would call attention to the practice of filling with New York City garbage. The area to be filled is extensive, and its value, when improved, offers great inducements to effect its improvement. The use of improper material in filling will undoubtedly cause disease when this area is occupied, and we would recommend that the Health Board be empowered to regulate the use of material.

Appended to this report may be found the answers to all the "schedule questions," as far as they pertain to this city, from "A" to "N," and a copy of the municipal regulations and ordinances relating thereto. Also, through the kindness of the Chief of Police, and the Chief of the Fire Department, we append the answers to schedules "O" and "P." We also furnish the answers to schedule "R" on public health laws and sanitary officials.

[SEE PLAN.]

We present a special map or diagram, showing two blocks or squares of tenements surrounded by privies, and the close proximity of these vaults to wells. These tenements are located at Constable Hook. They are two-story frame double houses, with halls from front to rear, and occupied by four families each, each family having one living room and two bed rooms, windows in each room. The contents of the privy vaults are liable to overflow in wet weather, garbage and house slops are thrown often from the doors on the open space in front, and the wells are becoming contaminated and unfit for use.

The diagram illustrates the evils that will arise if this manner of building is allowed in any section of the district.

QUARANTINE SANITARY DEFENSES.

THE QUESTIONS OF QUARANTINE AND EXTERIOR SANITARY DEFENSES OF THE NEW JERSEY FRONT OF THE HARBOR OF NEW YORK.

BY ELISHA HARRIS, M. D., SECRETARY OF NEW YORK STATE BOARD OF HEALTH,

To Ezra M. Hunt, M. D.,
Corresponding Sec. State Board of Health of N. J.

Doctor: In complying with your request in regard to a review of the questions relating to the quarantine and external sanitary defenses of the New Jersey side of the harbor and bay of New York, I am rendering a duty implied in the instructions I received from the National Board of Health, in August last.

As the harbor and port of New York touch the eastern boundary of New Jersey at the high-water line, for many miles, and as the quarantine jurisdiction of this port is now recognized throughout the coast line of the four northern counties of your State, at tide-water, namely, Bergen, Hudson, Essex and Union, the co-ordinate interest of New Jersey in the sanitary protection of the Port of New York, is too obvious to require discussion by us.

We may usefully consider these questions of co-ordinate interests and the sanitation of the entire port; its shipping, its waters and whatever defiles them; its shores and reclaimed grounds, and its islands and its wharves, docks and basins, as being alike important to the commerce, business and general welfare of the people of New Jersey and New York. We may estimate the strict correctness of this view by the census of the shipping in port any day in the warm seasons, as we frequently enumerated

the official shipping lists last summer and autumn. The annexed summary shows how the vessels which were accounted for on the 20th of September, 1879, as in the Port of New York, were actually distributed at that date, these numbers and their distribution being fair averages for the entire summer and autumn:

At the wharves and docks of New York	165
" " " Brooklyn	279
" " " Jersey City	39
" " " Hoboken	23
" " " Weehawken,	38
In the stream at anchor	34
" Long Island City	14
" Amboy, for cargo or repairs	14
" Staten Island	13
" Elizabethport,	5
" Quarantine	14
Total	638

At the same time a great number of small vessels, engaged in local traffic and not enumerated in this list, were lying at various places within the New York quarantine limits, between the line of the Palisades, on the north, and that of the Blazing Star, at Woodbridge, on the south. The U. S. Customs District; of Newark, and that of Perth Amboy, comprise a tidal front, within which our enumeration of vessels was not extended, but the summary on the preceeding paper is exclusively of vessels that were entered at the New York Custom House.

The one hundred or more vessels thus moored constantly at the Jersey side, while nominally at the port of New York, constitute more than a tenth part of all the vessels constantly in the port. Therefore the question, "is New Jersey concerned in any of the quarantine measures of this port and of the nation?" is to be answered affirmatively. The corollary of this question is, necessarily, "*If so concerned*, how shall this extended or most populous region of New Jersey secure all the protection needed to maintain all the safeguards which her people and their commerce and vast investment and great thoroughfares require?" Let us proceed to answer these questions by examining the facts concerned.

The sanitary interests of the entire tidal front of New Jersey,

from Sandy Hook to the northern limit of Bergen county, sixty miles nearly, are identical with those of the port and city of New York, and with some fifty miles of the Long Island and West Chester coast-lines, which complete the opposite outline of this port. The history of the quarantine system in this port, shows that in 1758, when the peninsula of Communipaw and Bergen was a wilderness, the Colonial government of New York designated Bedloe's Island as the northern limit of the quarantine anchorage grounds. In 1794, the limits and the hospital station were changed to Governor's Island, to the great peril of the city of New York, and in 1799, the establishment was removed to Staten Island. In thus providing for her own protection, the State of New York secured the necessary safeguards for the Jersey side of the great harbor, as that shore was then, and until recently, occupied.

The port of Perth Amboy had its own sufficient system of sanitary defense, its quarantine law dating from 1799, and for many years its health officers acting in harmony with those of the quarantine office at Staten Island. Though Amboy was once menaced by a very limited infected district, and had, in certain years, numerous arrivals of infected vessels at her quarantine anchorage, the statutes relating to port quarantines in New Jersey remain very simple, and as regards the vast new city and rapidly-growing commerce of Jersey City, and the entire tidal front of Hudson county, the changed condition of things will not now admit of completely adequate sanitary police measures, in the nature of quarantine defenses, unless such measures are co-ordinated with those of the quarantine system of the port of New York. Even when so co-ordinated, there still must be such a sanitary treatment of the vast area of Jersey municipal front, at and near the tide-level, as shall prevent it from becoming the very soil, and nidus of pestilential infection.

With this in view, my general report to the National Board of Health has arrayed the reasons and various facts relating to this subject which I would but refer to in this statement.

The graphic descriptions and correct maps which the engineers and surveyors in your inspecting corps have presented will fully explain the nature and importance of the points to which I refer in thus saying, without further explanations, that

the tidal front must henceforth be so treated as to be prevented from becoming the very soil and nidus of pestilent infection. That this can be done we know; and that your faithful expert assistants and you, sir, have correctly set forth and judiciously estimated the sanitary problems upon which such protection and future well being will depend, I fully believe. Millions of wealth and yearly gains, and the health and welfare of a great population which are crowding the longest tidal front of the port of New York, demand this forethought and plan for permanent improvements, and a carefully devised system of sanitary works and expert surveillance that shall extend along the entire eastern side of Hudson county, and eventually be imitated along the front of Essex, Union and Middlesex. It is to this unequalled shipping front that the largest products of the American continent will come, and there we shall see the greatest unbroken length of the world's shipping depots and accumulated products awaiting shipment. Even before a half century will have elapsed there will probably be more than a million of inhabitants in the five tidal front counties we have just enumerated. The sanitary problems are momentous to that population, and even more momentous to this nation, this metropolitan port and to the world's commerce.

We now inquire what are and what should be the exterior sanitary defences of the Jersey side of this port?

It is safe to assert that the exigencies of commerce and travel are such upon the Jersey side, as well as in New York, that no exclusive dependence on the port quarantine can give the necessary protection against liabilities to the carrying and occasional planting of certain kinds of disease poisons of germs. The West Indian commerce will menace our water sides occasionally, and other pestilent infections than that of yellow fever may come. The quarantine system of this port must be maintained most skillfully and faithfully, and yet the local sanitation and the methods of public health administration should be so adequate that any and all contagia and the causes of pestilent maladies shall be controlled, prevented, "stamped out." This is *practicable*, therefore *it is duty*.

The port sanitation and the naval sanitation will, ere long, be, to a good and efficient degree, nationalized; but even when perfect in all respects we must not lean upon quarantine solely for

the absolute protection that this vast port and, most decidedly, the Jersey side of the harbor, will require. The mere rumor, in a foreign tongue, that there is a yellow fever scare, or even a relapsing fever alarm, in New York, Brooklyn or Jersey City, Bayonne or Hoboken, will, as the stupid world of ignorant people goes, secures the blind edict of a relentless quarantine, like that which Portugal enforced against the State of New Jersey last year. Let the world be well assured that we are automatically secure and in an unbroken state of sanitary protection.

SOME OF THE ESSENTIAL CONDITIONS OF ABSOLUTE PROTECTION FROM EXOTIC FEVERS.

The Jersey side of our harbor has been remarkably *saved* from yellow fever, yet the entire area below the outcropping of the trap-rock, an extent comprising more than half of Hudson county, now the reclaimed grounds along the harbor are to be included, is naturally fitted to be invaded by yellow fever and other exotic infections. Systematic drainage, extended parks and good administration of public health service, will render the entire district one of the most salubrious. We have witnessed a most insignificant invasion of that little peninsula you call Caven's Point, (the most southern headland within the present limits of Jersey City,) in September, 1856. A new stateroom mattress had been washed ashore in front of the old mansion, then a family boarding house, half a mile from any other dwellings. It was a tempting prize, and so freshly cast upon the tide from an infected vessel, that it was not yet sodden through with sea water. Four days afterwards, the master of the house slept upon that mattress, in an open hallway. He died of black vomit a few days later, and two or more members of his own family and six of his boarders took the fever. Two of the latter died of the black vomit, and four others recovered in the quarantine hospital, under my supervision. Another field-laborer was conveyed to the same hospital in a dying condition from yellow fever. These cases are quoted from a vivid memory of the events to show what is possibly a future peril. Be forearmed, therefore, and you will protect one of the most promising and affluent commercial districts of the world. Repeated personal inspections of the several miles of tidal fronts of Hudson county, from the time I received cases of yellow fever that were thus traced to

a bathing or boarding resort there, have enabled me to appreciate the facts to which this statement refers. The comprehensive schemes of commercial development of the entire harbor-front of Hudson county now compel attention, and invite some adequate preparation in regard to the sanitary problems that will inevitably be important to the port, as well as to the property and commercial welfare of the Hudson county front of it.

About 3,600 acres of salt marsh and tide-washed shoals are being reclaimed and will, in the course of a few years, be covered by the structures that commerce and a busy population will need to find well defended against all sources of pestilential disease. Unless so defended, those 3,600 acres and homes of a million of inhabitants of the four contiguous counties may be frequently in jeopardy. Not only may the exotic germs of yellow fever menace that extensive area of made-ground, but the sources of evil will become inherent in that ground if its very grading and substance are not protected from the errors which we already witness in various places that are now being filled and built upon, in the absence of competent and faithful engineering plans. On the other hand, we now witness good work at certain points along the ten miles of front where improvements are in progress. We would recapitulate from notes taken while on the grounds and waters here mentioned, the following points relating to the protection which *local sanitation* should add to all that any rational quarantine service of the port can render:

1.—The filling, grading and artificial drainage of the reclaimed ground require skillful engineering, to secure every portion of the low lands and water front from becoming sodden with filth and sewerage. Though saturated to the plane of high tide level, all these grounds should be so treated as to remain free from mephitic emanations and be as clean and dry at the surface as possible. To permit these grounds to remain undrained, as they would be if not drained by a system separate from the sewerage, or to permit them to be badly sewered, or the sewerage to be debouched along the docked and bulkheaded front, would create an inviting nidus or prolific ground for propagating dangerous disease.

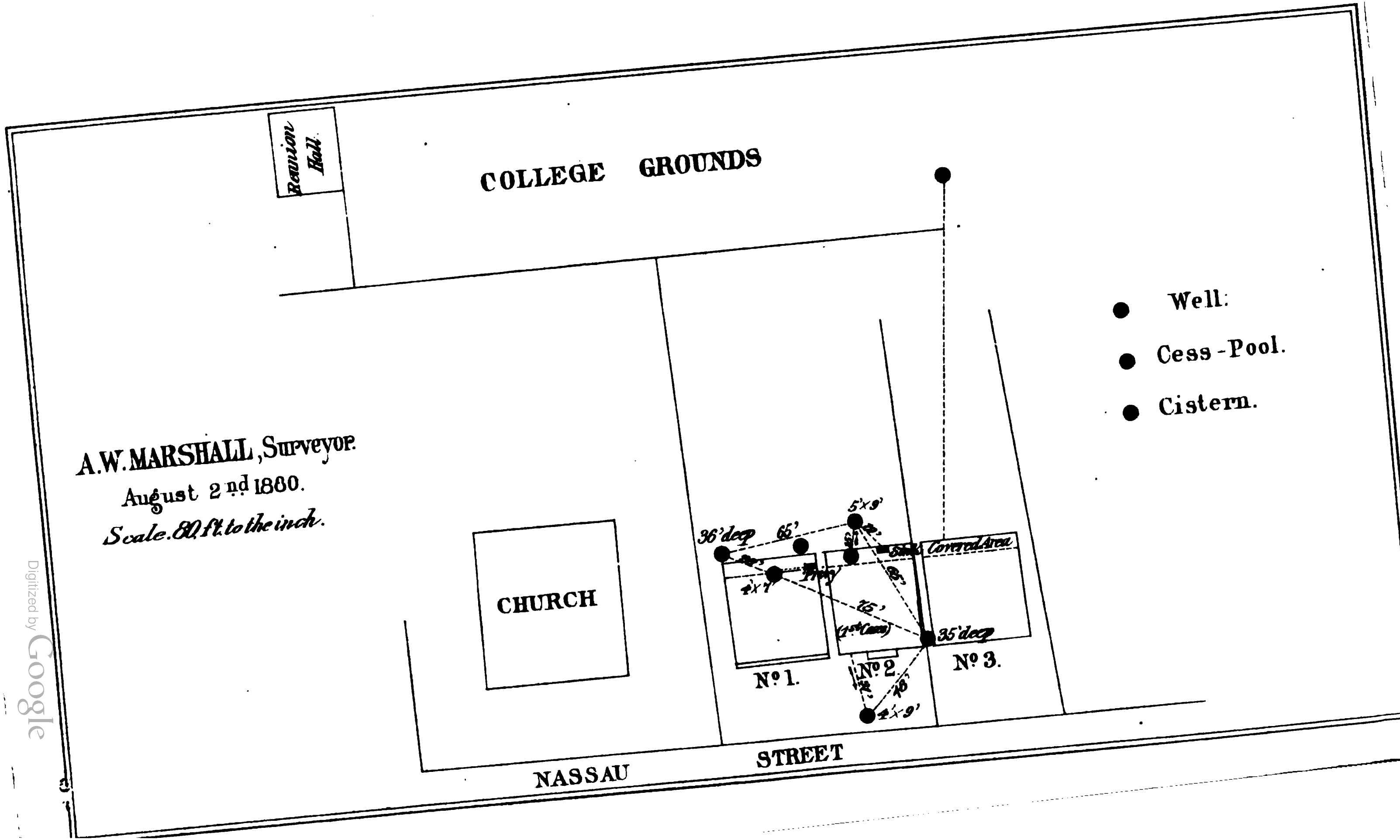
2.—All wooden crib structures along the tidal front or the streams, whether to facilitate the filling and bulkheading, or to

serve as the bases of docks and wharves or buildings, will prove to be snares and unsanitary conditions when too late to be prevented.

3.—The Hudson county sanitary authorities, or the State Board of Health, will need refuge or exterior sanitary station, within easy access from any portion of the region of New Jersey, comprised within the U. S. customs districts of New York, Newark and Perth Amboy. This, as a matter of prevision and specific plan and method, is all we here can mention. The facts stated by you, sir, in the Third Annual Report of the State Board of Health, concerning a temporary arrangement with the quarantine authorities of New York, convey a correct idea of both objects and means in regard to such an exterior safeguard. That which was extemporised last autumn as a substitute for an independent sanitary refuge or quarantine lazaretto and boat for the immediate segregation and removal of *infected persons and material,* may be rendered so permanently a ready method that New Jersey shall never lack a perfect preparation for this exterior sanitary police service. The peculiar advantage of such an arrangement for acquiring the benefits and all facilities of the New York quarantine islets, lazaretto and transport steamboat is that of entire fitness, certainty and promptitude of the sanitary duty itself, especially if Hudson county will maintain a convenient boat landing at its old alms-hospital front. These facilities would give some very desirable kinds of protection to the Jersey side of this port, and would prevent needless and harmful alarms and exposures as regards the portable pestilences to which the shipping and the railway depots may at times be subject.

4.—In conclusion we notice that the method and almost undefined limitations of the *riparian* titles and properties, as at present acquired by individuals and corporations, under the New Jersey statutes, do not seem to recognize the obligations which may become due to the sanitary authorities. This is not here mentioned as a criticism, but simply as a fact which readily may be remedied without any impairment or invasion of the riparian rights. To protect by the safeguards of law and of official surveillance all and any of the extended harbor front of your commercial districts, is tantamount to a protection and insurance, and even an enhancement of the cash values of every

portion, while by this means all burdens of quarantine and of nuisance litigations may be prevented. But it is less the present than the future interests we here allude to; and we must consider that as the State is now rapidly selling these riparian properties, as mere property, without reference to the sanitary questions which will be important in a near future, the present is the proper time for this suggestion.


Reunion Hall
COLLEGE GROUNDS
Well.
Cess-Pool.
Cistern.
A.W. MARSHALL, Surveyor.
August 2nd 1880.
Scale. 80 ft. to the inch.
CHURCH
36' deep
65'
5'×9'
Covered Area
75'
35' deep
No 1.
No 2.
No 3.
4'×9'
NASSAU STREET

ENTERIC FEVER AT PRINCETON.

BY EZRA M. HUNT, M. D.

The State Board of Health of New Jersey commenced an examination into the sanitary condition of Princeton, on Tuesday, May 25, 1880. Vague reports had reached us that a fever of an intermittent or remittent variety was prevailing among the students of the College. One student had died a week after removal to his home, but it was claimed that the fever had no special type, and the fatigue of transfer had increased the severity of the symtoms. The disease was spoken of as malarial fever, a term not in use in any diagnostic sense in medical nosology. No case dates earlier than March 23d, probably none earlier than April, during the first week of which several cases commenced.

THE TYPE OF THE FEVER.

Careful inquiry as to the symptoms and cause of the disease, led other physicians, as well as myself, to entertain the belief that all the cases could not be identified as of the usual periodic type.

There seem to have been no new and well-declared cases in April, after the first week. It would appear from inquiry among students that many were complaining of headache and a depressed condition of vitality, and many were taking some tonic medicine. But few were interrupted from class attendance until about the 8th to the 20th of May, when there was a decided increase of sickness.

On the night of the 25th, a student died somewhat suddenly, after a sickness of ten days. His case had been called malarial fever, or towards its close typho-malarial. The State Medical Society of New Jersey was holding its annual session, at Prince-

ton, at this time. Some of its members, who had sought careful detail of this and the previous cases in April, were convinced that the fever was endemic in its character, and not of the usual remittent type. The case referred to had been seen that day by one or two of our most competent medical men. They had no doubt that the patient died of typhoid fever.

In addition we have reason to think that a majority of the students were not in a ccndition of health, such as generally exists in this college.

During the months of April, May, June and July, there occurred, in all, about forty cases of this, or a kindred type of fever, and eight deaths. The physicians of Princeton, some of whom regarded their first cases as remittents, and some of whom claim that there were cases that showed no typhoid element, nevertheless recognize that in the cases that proved fatal and some others, the fever was distinctly typhoid.

Of one of the first, if not the first case, I have the following detail from his own brother, an able medical practitioner.

PATERSON, June 5, 1880.

DEAR SIR:

Your letter to Dr. H. of Glen Gardner, was forwarded to me with a request to reply. My brother left Princeton April 8, 1880, reaching home in afternoon of same day, very much exhausted. He had complained of being sick some two weeks before leaving P., though able, through considerable effort, to prosecute his studies. While in P., his symptoms were loss of appetite, alternating diarrhœa and constipation, headache, slight fever and general prostration. Upon his arrival home, he at once took to bed, complaining of general lassitude, nervous irritability, fretful, and fearful concerning his recovery. My brother was telegraphed for on Saturday, the 10th, but did not get there until Sunday, the 11th. He found him as above described, except a sore throat. His first impression was that of typhoid fever, but on the following morning, he noticed what seemed to be the remains of a diptheretic membrane with general pharyngetis. The next day, Wednesday, I was telegraphed for. I left immediately, arriving there at 11, P. M. I found him with temperature 105°, pulse, 140. He had been delirious all day, and was partially so on my arrival. Under large doses of quinia and sponging, his temperature marked 103½°, at 8 o'clock, Thursday morning; in the evening of this day, it reached 104½°. On Friday morning it again fell to 102¾°, but in the afternoon and evening of this day it again went to 105°. Saturday it continued

nearly the same. Sunday there was no accurate temperature taken, as you will observe the reason where a full history is noted. He died early Monday morning, (1 A. M.) April 19th. The pulse, during the days before Sunday, ran from 120 to 140; but on Sunday it reached 160 and 180, and so feeble and rapid that an accurate count could not be made. There was delirium all this time of an active character. He was, until Sunday, able to recognize an acquaintance, and call out the name when requested, though he was unable at any time to understand a conversation or to make an intelligent reply, or in condition for any one to converse with him the last four or five days before death. The tongue was exceedingly dry, swollen and cracked; the fauces red, and the same general appearance as the tongue. There was, at times, a considerable secretion of yellow, tough mucus in his throat, which caused a good deal of choking. It was necessary, at times, to clear his fauces and mouth with the fingers and wet rags. Sordes covered the teeth. There were involuntary discharges. On Friday, the stools were largely of blood, and were quite copious. The abdomen was tympanitic and very markedly so Friday, Saturday and Sunday. Milk and other fluids were vomited the last two days. There began, on Thursday, a considerable jaclitation. The flexor muscles of the arm and fore-arm were in an almost constant state of clonic contraction; this extended to the muscles of the neck, face, jaw and eyelids. This agitation increased in extent and violence each day until his death. The hands were fixed firmly upon the fore-arm, the fingers left their imprint on the palms of the hands and the fore-arm upon the arm. He needed constant assistance and great force to control the constant movements. The muscles of the lower jaw were in such a constant tremor that it was almost impossible for him to swallow. The muscular spasm did not extend to the lower extremities until the morning of the 18th, the day preceding death, when the flexor muscles were more or less involved. There was none, or at least very slight, oposthrotonos. I think the head was thrown back slightly, though probably due to the spasm of the muscles of the neck. There were a few (three or four) rose-colored spots over the abdomen, which resembled typhoid fever spots; they disappeared under pressure; they were not seen only three or four days. The vomiting was probably partially due to the extreme tympanitic condition. His tongue was exceedingly dry and cracked, and at times he was unable to protrude it between the teeth. The teeth were completely covered with sordes. My diagnosis was typhoid complicated by irritation in basilic and upper spinal region. If there is anything more you would like to know, address me here and I will write at once.

Respectfully yours,

G. W. T

Two cases which I saw in the earlier stages, about May 27th, were distinctly typhoid, and were so considered by the attending physician. On May 31st, being summoned by telegraph to see Dr. Wycoff, who had been taken ill, I saw for him his fever cases, six in number. Of these, four had the typhoid rash, and all had the symptoms generally accompanying typhoid fever. Prof. Austin Flint and Prof. E. G. Janeway saw other cases which satisfied them that the disease was enteric fever. I have heard directly from several cases which were treated by able physicians, at the homes of the students in other places, and which were distinctly recognized as typhoid. In the cases of death, most of them had serious hemorrhage from the bowels, and in one case death was sudden, as believed, from perforation of the intestine. Most of the cases had the rose-colored or lenticular eruption. The only case in which a post mortem was hoped for failed by delay of communication, but it scarcely seemed necessary to confirm so many agreeing diagnoses, except as such evidence is always valuable as corroborative. There were, in some cases, variations such as raised the question whether there is a fever which may be called sewer fever, in which the blood poisoning is modified from the abdominal typhus of the Continent or the typhoid of Great Britain; also whether in two or three of the cases there was a malarial element sufficient to justify the term typho-malarial.

Two years previously we had under observation, under similar circumstances, over one hundred cases of typhoid at the Reform School, at Jamesburg, which, like some of these in their inception, were regarded as remittent. A study of the details of that endemic, as given in the State Report of 1878, is an instructive introduction to the etiological study of this Princeton outbreak. Its last page of warning may get new emphasis from this trying repetition. The study of the two, side by side, while showing some of the milder types of the disease, some of those variations which are recognized, do not affect the identity or the identification of the fevers.

COURSE OF INVESTIGATION.

From verbal inquiries made, I became so concerned as to the probability of local existing causes, that I remained after the adjournment of the Medical Society, on the 26th of May, for the

purpose of knowing as to the water supply, and examining into the sewer and indoor appliances of the college building, so as to confer with the other members of the State Board of Health. It did not take long to discover some serious local defects, and such as made it evident that it would be our duty to make an examination in detail. A note addressed to our Board the next day, by the City Clerk of Princeton borough, asked an investigation in the interests of the town. The death of one student on the 25th instant, and of another on the night of the 26th, who was suffering from fever, together with the opinions expressed by many physicians, caused much alarm. On the 27th, I telegraphed to the City Clerk to hasten forthwith the organization of a Local Board of Health, which had been neglected. The 28th I returned to Princeton to carry on the work of investigation, and continued the examination of the water supply of the college buildings, and its entire system of sewage.

WATER SUPPLY OF THE COLLEGE.

The supply of water was derived from a spring on the ground in the rear of the college buildings. This spring was carefully covered and protected from all outside contamination. The fall previous it had threatened to fail in furnishing an adequate supply of water, and so had been enlarged into a kind of well. It was about eight feet deep, and collected the surface-soil drainage from the direction of the college property, through a soil fairly adapted for percolation, along the row of buildings nearest to it. Several hundred feet distant had formerly stood the privy resorts of the college. It was known to the secretary that several months before, in an examination of the underground of a dwelling house on this line, there had been found an amount of organic material out of all proportion to any natural condition of decaying substances in soil. The examination had been made on account of sickness in the family. While it was alleged that this was local and that the trend of the underground was such as to feed this large surface-well from another direction, it was plain that such a source of water supply can only be relied upon when it came from surface soil kept clear of organic filth of all kinds.

So long as such a spring or surface-well is in an open country district, and so long as the ground soil through which it perco-

lates is fitted to act as a filter, and is itself free from undue organic matter, the water is likely to remain pure as this seems to have done. It had of late been carefully watched and examined by the Professor of Analytical Chemistry. There is not reason to believe that up to this time it had suffered from the infusion of any sewer material into it, or that it had become fouled by organic matter in the soil. Yet as increase of population in a town like this always subjects natural surface springs to sources of befoulment, it is not safe to rely upon such an one for a large permanent water supply in such a locality.

RESERVOIR.

Another question as to water supply arises from the method of storage. This water was carried by an iron pipe to a reservoir, situate about fifteen feet from a large artificial pond, formed by the damming up of the storm and drainage water from the direction of the college buildings. At one time more recently, the water in the reservoir was found on chemical test to be of a lower standard of purity than that of the spring tested at the same time. The amount of water used in the college buildings also leads some to believe that the reservoir obtained a supply not only from the spring but also from the adjacent pond and grounds. It was not a cemented reservoir.

It is probable that the reservoir had, at times, some supply from such sources. Although this might give more of the products of vegetable decomposition, it is not so seriously different in source from the spring supply as to furnish adequate reasons for the prevalent sickness. The water from this reservoir was pumped, by an engine, into one of the colleges, and from tanks, distributed to the various buildings. These tanks were never intended to become dry, and have never been known to be but once or twice. The tanks were not, in every respect, the best, and yet nothing was found in these to account for the sickness. While then this water supply, as a permanency, cannot be depended upon, it is not believed that, up to this time, it had been the cause of any sickness of a typhoid character.

IMPERFECT DRAINAGE.

A question here arises whether any evil results, in the form of fever, did occur from the ponding of water and the interference with natural drainage, which is to be found in the rear of the college buildings. Since, it is claimed that, beside typhoid, there were some cases of remittent and intermittent fever.

The ground below it in the vicinity, is wet and somewhat marshy, and is in a condition favorable to interrupted or abnormal vegetable decay. Water is now believed to be a conveyancer of miasma, when it is derived from low ground and from a marshy vicinity. The evil cannot be detected by chemical examination. Both the well which furnishes water to the college, and the undrained ground which furnishes malaria to the air, could easily furnish elements which, combined with local complication of a nosocomal nature, must give rise to a fever of typo-malarial character. Princeton is naturally one of the healthiest of towns, and free from malarial influences, as the testimony of all the resident physicians shows. It can only be made unhealthy by neglect of, or interference with natural drainage, and by the accumulation of evils incident to congregated life. While we believe the drainage of all this district has been somewhat neglected, and much construction done without proper preparation therefore, it is not probable that this was the existing cause of the outbreak.

While thus presenting the facts as to the drainage and water supply of the college, our conclusion is that we were unable to find in it adequate reasons for the outbreak of disease at this time.

HEATING AND VENTILATION OF THE COLLEGES.

As the fever had occurred in the spring, it was not found necessary to make an exhaustive examination as to the modes of heating and ventilation in the college buildings. The heating of all the dormitory buildings is by open grates or stoves, with the exception of Reunion Hall, which is heated by steam coils. While some defects might be noted by experts as to facility for natural ventilation, yet none of those examining the buildings were disposed to attribute the sickness to structural defects as to these matters.

SEWERAGE AND WATER-CARRIAGE SYSTEM.

Our first examination, made on May 26th, was in three of the buildings, commencing in Witherspoon Hall. It was found that each entry was supplied with a small iron trough, similar to a kitchen sink. Over each of these was an iron pipe with a faucet communicating with the tanks and water-supply already described. All water used in the college was furnished from these. These troughs received all the liquid slops of the college, including all waste and chamber water. These had the S or Adee trap and ended in an upright soil-pipe. This passed from the various stories of the building into the continuous soil-pipes, until from the various directions they united at the Witherspoon Hall, carrying the liquid refuse, and also receiving the storm water from the leaders in time of rain.

Near where the soil-pipe and water closets pipes join, and on the inner side in Witherspoon Hall, there had been built a ventilating flue connected with the chimney, for the purpose of securing perfect ventilation between the large sewer main and the buildings. There had also been made a man-hole or ventilation opening into this main sewer, a few hundred feet in the rear of Witherspoon Hall. The workmen seemed to have mistaken the ventilating flue for a part of the chimney stack, and had gone round it with the sewer or soil pipes, avoiding connection. The man-hole outside had also been made tight and covered with ground and sod. So there was no inlet for air between the sewer main and its cesspool, and the water closets and entry sinks of the colleges, save what might be furnished by the storm leaders near the roofs; these, in times of storm, might siphon the ventless traps. The pressure of the sewer gas must often have been sufficient of itself either to siphon the traps or to force itself through. It is known that these traps were, at times, empty. This is made still more obvious, as we follow on, to notice the condition of the cesspool at the terminus of the sewerage system. This tank was built underground, beside the railroad track; it is an oval, fifty feet long, eleven feet deep, and eleven feet in its oval diameter; at each end it had a man-hole covered with a heavy iron lid closely fitted and covered over with earth. This cesspool was not cemented on the bottom, and was laid with loose stone part of the way upward; the sewer system from the

college entered it by a pipe about four feet from the top; there was an overflow pipe at the other end, two feet from the top, which thus made a water seal, and had generally served to carry off the super-abundant sewage by a pipe running for a few hundred feet underground and finally discharging itself along the railroad and upon the surface of a low tract of land. It apparently had been thought that the cesspool with its uncemented bottom would absorb much and that the rest would easily flow off, and that if, at any time, the floating matter in the cesspool become solid or cake-like, so as not readily to flow off, the flush of storm water from the roofs, at intervals, would answer for this purpose.

Prof. Brackett and myself first got access to it May 27th, one lid having been loosened the day before. This large cesspool was full nearly to its top with a black, tarry, offensive sewage. This covered the incoming sewer pipe from the college to the depth of two feet with a semi-solid mass, from which the foul escaping gases were bubbling. It was so tenacious as to stop up the entrance of the sewer pipe from the college, except as the back pressure become sufficient to cause an intermittent discharge. All sewage came from that direction without getting vent. The pent up gas in the pipes had but one ready escape and that was into the college buildings. Thus the soil pipe and water-closet system of the college was but an elongated cesspool with full arrangements for gas-discharge on each entry, both from the slop and water-closet apparatus, as the pipes of the latter joined the former near the buildings. Although the large cesspool had at its lower end an overflow pipe, intended each day to carry off any surplus, in the warm months of this spring, and the absence of rain, the mass between it and the sewer pipe had become too solid to be easily flushed off and too putrid to be retained.

With right traps in the buildings, with perhaps the addition of opening to the soil pipes on the roofs, and also vents to the traps as recommended of late, with the intended attachment to the chimney flue, and an open man-hole for free access and egress of fresh air, with watchfulness over the cess-pool to see that it was in working order, and with emptying when required by contingencies or by lapse of time, we can easily see how such a system might have been operated. But as it was it had been converted into a complete system for the storage of the

fouler part of sewage, so that its gases might be sent to the college buildings with the same precision with which lighting gas is kept in a reservoir and distributed through houses. Only in this case there must have been more constant escape. At the time of emptying this cess-pool, immediately after the adjournment of the college, there was also some sewage inflow from the direction of the colleges. All the buildings known as Witherspoon Hall, West College, Reunion Hall and East College, as well as the University Hotel, were connected with this system.

The School of Science and some other buildings were connected with just such a system and with like defects, which had its terminus in a smaller cesspool on Smith street, and was in no better condition. It is easy to see how, by such a state of affairs, the air of the college buildings could be laden with particles or so impregnated with aerial sewage and gases as to be deleterious to health. There can thus be no doubt that in the college buildings, in the University hotel and in one of the Professors' houses, there were found soil-pipe and water-closet connections highly favorable for the introduction and extension of foul air in the form of aerial sewage.

Only two questions confront us: As a matter of fact, did the disease commence in the college, or from a similar or still worse condition, in a students' boarding house? Wherever it commenced, was it of spontaneous or local origin, or was it introduced from some other focus, and then spread by these favoring and fertilizing provisions therefor?

FIRST CASES.

To throw light upon these questions, an examination of the earlier cases is of primary importance.

By the kindness of the college authorities, I early received a list of all known cases, with the places of rooming and of boarding specified, and have verified the dates of attack. These are given without repetition of the names, and with some slight alternating corrections, as furnished by personal inquiry and correspondence.

	ROOM.	CLUB.	REMARKS.
THE SMITH WELL CASES.	A House No. 2	House No. 2	Remittent fever; Scarletina, (?)
	B 13 S. E.	"	Left here April 8th. Died 19th.
	C 10 W. M. Witherspoon	"	Left here sick early in April. Had Typhoid fever at home.
	D Dohm's	"	Left here April 5th or 6th. Typhoid fever at home. Dr. Fay, Altoona.
	E 10 N. R. H.	"	Sick in Princeton with Typhoid fever early in April.
	6 N. M. R. H. Colored housemaid.	"	Left April 1st. Sick at Auburn with nervous fever. No Typhoid fever. April 29th, removed. Sick two months.
WITHERSPOON HALL.	F 10 E. W. H.	Univ. H.	Chill May 16th. Died May 26th
	G 12 E. W. H.	"	Went home sick May 24th. Typhoid fever at home, Madison, N. J.
	H 5 E. W. H.	"	Went home sick May 25th. Sick at Manhattan Beach Hotel.
	I 4 W. M. W. H.	"	Sick here May 12—26th. No Typhoid development.
	J "	"	Sick May 23d. Still sick here, (Aug. 20).
	K 2 E. M. W. H	"	Sick and went home about May 24th. Came back about June 1st for part of two days. Returned home and died June 6th.
REUNION HALL.	L 5 S. M. R. H.	Jesse Williams	Sick here from May 9th to 27th. No decided typhoid symptoms.
	M 15 N. M. R. H.	Univ. Hotel	Went home sick May 24th. Had Typhoid fever. Wilkesbarre.
	N 7 S. R. H.	"	Taken sick about May 15th. Went home May 22d. Died June 10th. (?)
EAST COLLEGE.	O 13 N. E	Lavake's	Took cold, April 1st, lying on ground. Went home May 20th. (Doubtful case).
	P 18 N. E	Univ. Hotel	Went home sick May 17th. Had Typhoid fever.
WEST COLLEGE.	Q 3 N. W	Mrs. Harvey's	Taken sick about May 20th. Very marked case. Died July.
	R 6 N. W	Univ. Hotel	Same as above. Died July.
	S 1 S. W.	Clow's	Left about May 15th. Returned May 20th. Went away again May 25th. Sick in Newark. Died June 5th.
ROOMING AND BOARDING IN TOWN.	T M. House, No. 22	Parkhill's	One of the first sick, about March 14th. Went home about April 12th. Returned to Princeton about April 17th, and was again sick for a few days, but recovered here. Attended by Dr. Wikoff, who says his was not this fever.
	U M. House, No. 19	Univ. Hotel	Went home sick May 26th. Called Remittent fever up to May 31st. Died June 6th.
	V Mrs. L.'s	"	Went home sick about May 28th. Typhoid fever in New York.
	W Mr. L.'s, Canal street, previously at Lavake's	"	Had chills and fever about March 1st. Went home, returned, and was taken sick about May 10th. Typhoid symptoms.
	X Univ. H.	Univ. H	Complaining during second session while in 12 W. W. H.; moved to hotel about April (?) 21st. Died May 26th.

It is at once noticeable that the first seven cases of sickness occurred among those who cannot be associated as in any one part of the college buildings, or in any one place in town as to rooms, but who were alike in the one particular that they all ate in the same house. Of these, two lived only in the house, and one other had a room in town elsewhere. The others were in three different college buildings. One student was slightly sick in April who was not of this group—although named in another part of the list, it is evident from the account of his brief indisposition that he had no typhoid symptoms. Of these seven, six are reported to me as having had typhoid fever, unless one called nervous fever is an exception. Four of these were taken to their own homes and recognized as typhoid fever by their physicians there. The seventh one is claimed to have had remittent fever, and to have broken out with scarlet fever after he had been in his room over two weeks. His case was reported as beginning March 23d. The first student who died, and whose case has been already related, was taken sick March 26th, or as the brother's letter would date it, about two weeks before April 8th. Four other cases were taken so simultaneously, April 5th, as to lead the physician to suspect that there was some local cause and to make inquiries as to the well water, etc. Previous to these cases there were none of earlier date, which, before or afterwards, were identified as typhoid. These facts are so significant as to invite to close inquiry.

HOUSE NO. 2.

This boarding house was situated on the main street known as Nassau street, being the second house west from the First Presbyterian Church. One student boarded with the family and roomed in the house. The family consisted of four adults, including *servants, one of whom* had typhoid fever about April 25th. Two clubs boarded in the house, one consisting of thirteen college students and the other of thirteen seminary students and a college tutor. Why none of the seminary students sickened can be accounted for, the same as why only seven out of the whole number in the house sickened, or on the hypothesis that college students sickened because of the additional and constant exposures in the college buildings, or on the hypothesis that the cause of the sickness was only in the

colleges. Against this latter is the fact that so many sickened here and here only at first; that one was a servant in the family, and that one other not including the remittent fever case, roomed as well as boarded outside of the college. As two other houses were in close proximity and had either water or cesspool relations, we show on the accompanying map their position, the middle house being the place of sickness.

[SEE MAP.]

This house, No. 2, derived its drinking water and its upstairs wash water from a well located between houses No. 2 and 3, the houses being separated just enough to allow space for the well. The well is about thirty-five feet deep, and very old. The first sickness led to an examination of this well. The water, although it had not been complained of, was found so bad on chemical analysis, that Professor Cornwell thought that it could not be defiled by sewage alone. We tasted it in June, after it had ceased to be used, and could detect no foul taste, although it was chemically impure. In the front yard of house No. 2 was a covered cesspool, forty-eight feet from the well. This received the water-closet excreta of the house, and the bathtub water. The size is about nine feet deep by four wide. When examined, about one foot of semi-solid fetid matter was in the bottom. As the structure directly beneath is rock, the cesspool matter all along this section is only absorbed and disseminated laterally.

The next nearest cesspool is in the rear of lot No. 2, nine feet deep and five wide, and sixty-five feet from the well. At the time of examination in June, it had seven feet of water and filth.

In the yard of house No. 1 was another cesspool found in a still fouler condition, into which both the kitchen slops and water-closet refuse was received; this was seventy-five feet from the well of No. 2, with a foul privy in between. It was only twenty-eight feet from the well of No. 1, which was foul, and which is of the same depth and same water-bearing strata as the well of No. 2.

The only chemical difficulty in discovering whether sewage matter was percolating from these three cesspools into the well of No. 2, arises from the fact that there was a dead cat in the well. There was so much cat as to make it difficult to determine whether three cesspools, distant forty-eight, sixty-five and

seventy-five feet respectively, were also fouling it. The Chemical Professor thought there was more of the chlorides and albuminates than the cat would account for. The well is large and deep, (thirty-five feet,) and like most of the wells of Princeton, of this depth, cannot be pumped dry by usual method.

This water was used for drinking purposes and to different amounts by different students. Some of it was each day pumped into the up-stairs cistern for general water supply, communicating chiefly with the room in which one of the students was sick several weeks.

Besides these conditions, as to water, the house was provided with unusual facilities for the introduction of foul air. The cesspool of house No 1. was in the area, within twenty-eight feet of house No. 2, with the privy a few feet nearer. The rear cesspool of house No. 2 was fourteen feet from the house, and had from it an untrapped pipe in the area basement for receiving slops thrown into the sink. There was a rain water cistern under the piazza, which had its overflow pipe into the cesspool, and which thus let foul air into the area. Then in the brick floor of the basement there was an outlet for slops. In heavy rains the cesspool overflowed its filth water into the area so as to cover it. The dead mawkish odor, peculiar to confined sewage, had been frequently observed. As the property, when purchased, had these conveniences, the localities of cesspools, pipes, etc., and their connections were not known. The soil, beneath and about the building, was saturated with organic matter. The condition of the water supply, added to that of the cesspools, presented a more flagrant and dangerous complication than any found in the college dormitories. Both Professor Janeway and myself, who had occasion to act with E. S. Philbrick, of Boston, as a committee for advising what changes should be made, came, therefore, to the conclusion as herewith expressed.

"The disease was typhoid fever, caused in the first instance by the use of water from a well, which was proven by chemical analysis to be impure, in which a dead cat was found, and having such relations to cesspools, as shown by subsequent investigations, as to render its contamination by them extremely probable. We have been forced to this conclusion by the fact that the first cases of typhoid fever amongst the students during April, occurred in those boarding at the house using this well water, and

because these students who became ill lived in different buildings. Moreover, it has since been ascertained, that a servant who worked at this house, became ill at this same time, was removed to another house, and is considered by her physician to have had typhoid fever.

The evacuations from the students who had become affected in this manner were thrown without disinfection into the sinks and water-closets in the dormitories, and gained access to the sewer system of the college, and to the cesspools which formed a part of it. A subsequent outbreak of the fever occurring in May, was caused by the infection of the sewage of the college, contained in the aforementioned cesspools and pipes. On this occasion the disease was not limited as before, but followed the sewer distribution. The poison gained access through the sinks, water-closets, and the pipes connected with them.

The spring water used at the college has been analyzed a number of times, but without affording any evidence that it was contaminated; and we are informed that it has been used at several houses having a total population of about seventy persons, but having no connection with the sewer system, and that there has been no sickness in these houses. The view might be entertained that the foul-air conditions of the house co-operated with the water conditions and shared prominently with it in incipient causation, but at any rate it seems well-nigh certain that the local structural conditions in and about the house were the exciting cause whether through fouled water or fouled air."

WAS THE FEVER SPONTANEOUS IN ITS ORIGIN AS AN ENDEMIC HERE?

The question now arises whether the enteric or typhoid was implanted in such a favoring soil from some other person or locality or whether it originated amid these favoring conditions. It is well known that on such a question there are still two opposite opinions. One class of medical observers maintains that like small-pox "the disease breeds so true that no fresh case is known to arise except by contagion or infection from some previously existing case." As the view has gained ground that the specific element in the communication of diseases associated under *the name* "zymotic" is not volatile but "particulate" in that *it is in substance* not gaseous but solid, and so a particle, it must

be conceded as Russell has recently expressed it, "that the progress of discovery on the laws of the particulate theory of the contagia makes constant inroads upon the domain of the spontaneous or transcendental in the origination of communicable disease." So there is maintained "in the mind of the ætiologist a wholesome attitude of thorough skepticism as to the spontaneity in any instance of diseases known to be in some instances lineally propagated from pre-existent cases through ascertained media."

Dr. William Budd may be quoted as representing those who always look for a pre-existing case from which the infective particle was derived, either in person or through air or water, contaminated by the fecal discharges of the patient, while Sir William Jenner and Dr. Murchason represent those who, while recognizing this source, also believe that it may be generated independently of any previous case, and especially from excretions and from sewer fermentation and decompositions.

Dr. George Wilson, in his recent book on "Healthy Homes," says, "some writers maintain that genuine typhoid fever can onl[y be] propagated from a previously existing case or cases; but the[re is] a constantly increasing amount of evidence which goes to p[rove] that it is often induced by sewer air, foul effluvia from cesspools or polluted water, independently of any previous cases." (pp. 293.)

It therefore becomes the duty of any investigator—even if finding conditions highly favorable to the epidemic extension of any disease—to inquire whether its origin, after all, was not from some place, whither it had been brought either by a person sick of the diseases or by some medium that might have been infected from him or from his sickness. It has been said that enteric or typhoid fever is the most versatile of all the communicable diseases in its choice of a medium. (Russell.)

Since the conveyance of typhoid fever through milk that has either been watered with fouled water, or has absorbed infectious material from typhoid surroundings, has been proven, our first inquiry was in this direction. No clue could be found to any possible derivation from the source. Care was taken to trace the first cases to their home relations, to their absences from college, or to some other circumstances that might furnish evidence of transportation. While in the case of so composite a gathering, and of so many conflicting statements which have to be elimi-

nated, it is well nigh impossible to make such an inquiry exhaustive. After tracing carefully every possible or suspected source, we were not able to identify this as an imported disease. Several suspected sources failed under extended investigation. The next natural inquiry was, whether cases of typhoid fever had previously occurred in other parts of Princeton, the infection of which might have, in some hidden manner, reached the locality of house No. 2, so as partly to assume an epidemic form.

It was found that it is true of Princeton, as it is of most such sized towns with no Boards of Health, that causes for local diseases exist. Also that occasional cases of typhoid fever occur as brought from without. By careful inquiry of the resident physicians, and examination of the vital records, it was found that there had been no case of typhoid fever in Princeton previous to this outbreak, within two years. Six years ago, and again five years ago, cases occurred in town which were known to have been brought from other places. Three years since there were five cases in one family. In these cases it was believed at the time, after chemical analysis, that a filthy cesspool had found its way into the well, so as to foul the drinking water.

Two years ago last March, there were two cases in a professor's family, who lived in a hired house in the town. The well had gone dry, and it was necessary to blast in order to deepen it. After the water was secured it began to taste badly, and an odor was perceptible from the well. The sickness soon occurred. It was believed in the blasting a crack had been made which communicated with a cesspool. The well was abandoned and afterward filled up because of its odor. We could not obtain any clue which would, after so long an interval, associate any of these cases with those now occurring.

As it has been alleged that low forms of fevers have before prevailed at Princeton, we examined closely the records so far as available. We found ex-President MacClean, from a ready memory, able to give details which were corroborated by Dr. Stephen Alexander and others. The record, both of the college and the town, has, with rare exceptions, been one of remarkable health. It is said that twenty years at a time have elapsed without a single death of any student from any sickness at Princeton. Remittent fevers, except about the time of the digging of the canal, long years since, have been almost unknown. This year,

in the surrounding country, there has been more than usual of remittent and intermittent fever. It has generally been so rare that all the physicians have regarded any occasional case as an importation. Yet it is evident that structural changes, excavations and interferences with natural water-courses need here, as elsewhere, to be guarded against or compensated for. Three cases of typhoid fever occurred in the house of Dr. Farmer. He died, as did also one student of the college.

In 1835–6 occurred what has been spoken of so frequently since this outbreak as the *Princeton fever*. It was confined to one house and this happens to be house No. 1 of our map, and what may be regarded as a part of the same plot in which the first case occurred this year, since it is only separated by a few feet used in common. In the house, now occupied by Dr. S. Alexander, there were then five deaths from typhoid fever, and one or two more who recovered after prolonged illness. One student died and two physicians in succession. The sickness was attributed to the well, which was found to be receiving the household slops. The well was long known as the *sickness well*, and was abandoned for about two years, but is now used, although found in bad condition at the time of our examination. No sickness has occurred in that house since, which could be attributed to any local causes, although the family of adults is believed to have suffered in general health from impure air and water. The fact of locality, so far as the present epidemic is concerned, we can only regard as a coincidence, and as having no causal relation. The fact of a graveyard having once existed in the rear of house No. 2 was also brought to our attention. It was found that some seventy years ago there were, several hundred feet from the house, five or six gravestones, probably the remains of some family ground before the college was located at Princeton. "There have been," said President MacClean, "no burials there in the memory of man."

It would seem, from all the facts that we gathered, that typhoid fever commenced here only because of certain more recent and local structural conditions, and was extended into an epidemic by prevalent conditions in the college, as also in a few houses in town.

That the fever did not get a more rapid and disseminated hold at the time, is to be accounted for by the fortunate occurrence of

the Spring vacation, and the fact that none of the earlier cases remained in the college buildings. About two weeks after the return of the students, April 22, new cases began to appear, which might easily occur from excreta, or the continued operation of the same causes, or from the predisposition which had been established.

So soon as the cases were recognized as typhoid fever, dependent upon local causes, all officers of the college were prompt in ordering an adjournment. We believe thus only was it saved a far more wide-spread and fatal epidemic. At the very day of adjournment we found the excreta of typhoid fever patients being emptied in a common water closet, and believe that the seed had been sown for a prolific harvest of death. However sad the record, with all the facts in evidence before us, we rejoice that the scourge was not more intense in its virulence and more wide-spread in its desolation.

CLIMATIC OR WEATHER CONDITIONS.

The question occurs whether there were at this time, either in thermal or atmospheric conditions, any reason why the material of cesspools or sewers should thus become operative, or why soil or air or water should be unusually impregnated, or persons have an unusual predisposition to such influences here. It is fully recognized that conditions of temperature, moisture, and prevailing winds may determine the outbreak of an endemic or epidemic disease. These would be inoperative without the necessary materials to operate upon were present in the soil, in the atmosphere, in the food or drink, or in the person. On the other hand the material might be present in any one or all of these, but be restrained in operation because of the absence of the heat, moisture or other conditions necessary to development.

A record of the meteorology of the year from July 1st, 1879, to July 1st, 1880, and especially of the latter six months, shows some exciting causes well worthy of attention.

We refer our readers to our tables for this period as worthy of study on another page. The winter was an unusually open one, with much less frost and ice, and with a smaller amount of rain than usual. The average temperature of February, March, April and May was much higher than ordinary.

The deficiency of rain was such as almost to occasion a March drought. The accompanying graphic map presents the lines of temperature, humidity and rain-fall from January 31st to May 31st, 1880.

The failure of flushing the sewers of the college, which depended so much on sluice-water, has already been noticed, and no doubt contributed much to the filling up of pipes and the influx of sewer air.

It affected still more the wells which are the vertical drains for an area of which they form the center. If the ground about them is filth sodden, or abounds in organic matter, or if having combined with cesspools it is never so sure to pollute the water supply. The favorite and only and time-honored method of sewage disposal in Princeton Borough is by uncemented cesspools in the rear yard and often in the front yard, and sometimes in both, nicely covered over and sodded. They are expected mostly to take care of and empty themselves. That means that the ground soil shall so absorb the liquid and muck of the semi-liquid and fecal matter as to make the need of emptying the exception. This may do for a time where population is sparse and regulations enforced, or longer where the water supply is not derived from wells. But it is a most hazardous experiment when it is followed up in a compact town, and only awaits favoring warmth and weather to stir these multitudinous cauldrons into activity, and with a soil unusually and unseasonably dry and warm, the first natural diversion is the well. As this cannot afford full relief, the air undertakes to be a corrective and so becomes the common carrier of whatever effluvia may arise. Some parts of Princeton are kept with scrupulous care, and the objectionable conditions are flagrant only in one or two small sections, or in here and there two or three adjacent houses as they were in the two houses shown on our map. A dead animal in the well—three cesspools within seventy-five feet, tainted air from these and from the overflow in the house, and the previously favoring weather conditions seem to have precipitated the crisis. The condition of the college sewers and of some town localities favored the progress of the infection.

The college having been dismissed and this deportation as the first thing resorted to, it is proper to note some of the means advised to overcome the disease, and to insure against recurrence.

1st. The cesspools were emptied, cleaned and disinfected.

2nd. All the sinks and the water-closets, and the pipes which connected them with the cesspools have been removed from the buildings; and the pipes outside of the buildings have also been taken up.

3d. The rooms have been cleaned, and those in which sickness occurred have been disinfected.

4th. The use of cesspools has been given up and a temporary arrangement provided which will avoid liability to disease. A permanent system of sewage and slop disposal is in course of construction, which is in accord with the development of sanitary science. Mr. C. E. Philbrick, Civil Engineer, of Boston, Mass., has charge of the construction of the new system. The water-closets are located in a separate building and have no connection with the dormitories.

5th. Two large cisterns have been built to hold filtered rain-water, collected from pure sources, to be used as drinking water.

6th. The house where the disease originated has been thoroughly overhauled.

7th. It was recommended that students be prohibited from boarding at houses in a defective sanitary condition.

This latter was rendered necessary from the fact that very insanitary conditions were found on the premises of several boarding houses. The location of many wells and cesspools was such as to make it obviously unjustifiable to expose students to the possibility of such soil and water contamination. This was made the more obligatory from the fact that scattered cases of typhoid fever had occurred in the town during the vacation, and even when college assembled, although it had been put in so thorough a sanitary condition, the fact of existing cases in town made it necessary to protect the students from such possibilities. It was unfortunate that the Health Board of the borough did little during the summer, but we believe that it is more alive to exigencies which exist and which must be remedied upon a plan.

FUTURE WATER SUPPLY AND SEWER SYSTEM.

Either the uncemented cesspool system, or the wells must be abandoned in Princeton. It is hazardous to secure drinking water from the same soil in which these exist in near proximity;

with the soil and understructure of Princeton it is aboslutely unsafe.

The water-bearing strata of the borough is nearly the same in its most closely inhabited sections; it is reached through deep wells and rock, so hard as often to require blasting; the water as thus secured would be good if no surface matter could reach it, but the rock extends within a few feet of the ground surface; it is a hard shale arrayed in layers. This compact rock causes organic matter to remain near the surface, or if liquid or semi-liquid, as it must become through accumulation and by storm water, it forms into streams or little trickling rivulets along the surface of the rock. It is found that this rock is blocked off, or has frequent seams or joints, so that at points not suspected and sometimes quite distant from some series of cesspools, the foul substance can find exit and so reach wells, and mingle at the water bearing strata. These joints are much more frequent than in trap rocks. Here and there a well is thus known to be impure where there are no cesspools immediately adjacent. Such a condition as this demands either a constant watching and testing of almost each well used, or the prohibition of uncemented cesspools, or the use of cisterns, or the procurement of a water supply away from any possible household or populous complications. The risks are greater to the town than to the college, since the buildings of the latter need not be closely located, and its facilities for collecting and storing water from the buildings are greater.

In reference to all that relates to this outbreak of enteric fever at Princeton, it must only be said, that in its chief feature it is only a repetition of what has elsewhere occurred over and over again from similar causes and complications. There are many towns that just after this fashion are storing up material for just such sickly and deadly use in the future. By a want of co-action or co-ordination of conditions of water, soil and weather and susceptible live material, the evil day has thus far been postponed. Some have postponed the evil by securing a separate water supply. Although still polluting the ground, its results are, for a while, delayed by nature's conservatism, or by flight to the sea shore, or other methods of avoiding the continuous inhalation of polluted air, or when such air is inhaled, if it is common foulness and has not yet attained to specific contagion, it only causes

that general malaise and weariness and half force which devitalize and demoralize population, and so is now sapping vital power by insidious inroads, instead of decimating by virulent epidemics. There was no other way to convert New Orleans and Memphis to correct hygiene except to have yellow fever. It may be that our New Jersey cities, will continue to foster insanitary conditions until they too have some significant losses, or until there is a general reduction of the standard of good health, so pronounced, as to exhibit itself in the statistics of mortality. Still with the noble advance made in our own State in the last three years, and with an increase of intelligent popular sentiment and official power, we cannot but hope that many of our cities and townships will, more or less rapidly, put themselves upon a better health basis, and secure for themselves and for their homes, that blessing which, more than any other human gift, tends to life, liberty and the pursuit of happiness.

SANITARY INQUIRIES INTO ALMS-HOUSES AND JAILS.

BY WM. M. BAIRD, M. D., WASHINGTON, N. J.

With civilization we have the care of the criminal and dependent classes to engage our attention; and that they may be cared for at the least expense to tax-payers is an important consideration. But a higher and more important consideration is the giving of such care as will lessen the numbers of these classes in the future. Indeed, as a matter of economy to tax-payers, it is not so much what it will cost per diem to support these classes, as what measures shall be inaugurated to make the greater number of these dependents self-supporting, and to cause the largest proportion of the criminals to lead honest lives, that society will not be forced to protect itself by confining them.

The part that race, inheritance and various physical defects have to perform, I take it is the part of the subject our State Board of Health wishes to grapple with. That these, in various forms, have much to do with producing these social diseases is only too true. As directed by the Secretary of the Board, I made a visitation to several counties and only confirmed my previous opinion that many needed reforms were necessary before New Jersey would be up to the times in the care of her dependents and criminals. The majority of the people and, indeed, of officials appear to think that if they are well housed and fed that is all that is necessary; that to consider the subject in its higher relations is superfluous. The consequence is that a needless expense is entailed on the tax-payers of our State, and the prevention of pauperism or crime receives but little attention from the masses.

JAILS.

I visited the jails of Warren, Morris, Essex, Union and Somerset counties.

WARREN COUNTY.

Warren county jail is in the Court House, at Belvidere, the county seat. A recent Board of Freeholders remodeled the Court House and rebuilt the jail. It was originally built in 1825, and rebuilt in 1870; constructed of brick, it now consists of a new and old part. It is seldom that more than a few prisoners are confined in it. Cells are built so that the back walls of two cells abut each other. As soon as prisoners arrive, they are taken to a bath-tub and given a bath, and then assigned to their cells. The court surrounding the cells in the new part is quite well lighted, and natural ventilation has a fair opportunity to do what common sense failed to do. In the old part the court is not so well lighted or aired, but the height of ceiling, the cleanliness observed and few occupants, make the air supply very good during the day. The cells are ventilated by a hole opening in an air flue, common to the cell and the area back of it. I found no draught at the air holes on holding a lighted match to the opening. No arrangements are made for forcibly removing the air, and the ventilation of cells is sadly defective. The cells in all prisons visited by me are small and the arrangements for thorough change of air should be very complete. In this jail a frequent whitewashing does much to keep the air sweet; the excretions at night are received in tin pails with covers. In the jails are water-closets for use during the day. There is a privy in the out-yard. The water-supply is from the Delaware river, and is furnished by a water company supplying the town. A plentiful supply of water is had for cleansing purposes and for flushing pipes. Slop water and excreta are carried into a large cesspool in the back yard. This pool has no ventilation other than through the ground covering it. The jailor says there is *said to be* a cistern under the new jail. This, being confined and without ventilation, may be the means of not only breeding disease to certain criminals there confined, but to others whose province it is to mete out justice in the rooms above. The danger from this is not so great, however, in your reporter's opinion, as it is from the fact of having a good water-supply and very bad method for the disposal of sewage. The officials stated that they believed they had good traps. But when sewage is run into a cesspool tightly covered and there generates gases, and

when more sewage is run into the pool, this will either compress the gas or it will escape somewhere. Undoubtedly a great deal gets through the tank and passes off through the pores of the soil, but, unfortunately, the covering does not always permit it to pass off rapidly enough.

When pressure is brought to bear by this compressed gas in the trap, I fear the trap that will prevent its escaping in the apartments behind it has not yet been patented. The county is not so much to blame for this negligence as the town, for it is the town which will have to suffer in the future by its soil becoming thoroughly impregnated with sewerage matter.

DIETARY.

No regular dietary is had for each day, but the aim is to give the prisoners a change of diet. A physician is appointed by the Board of Freeholders, and is required to attend whenever called or when he deems it necessary; he is also required to furnish his own medicines without extra pay. The only labor imposed on inmates is caring for their apartments and cleaning up, whitewashing, &c. Tobacco is furnished to those who use it and the amount expended last year for this important article was $9.35. Alcoholics are not furnished. The people of the town occasionally hold services there on Sunday afternoons. A few papers are given them by officials and some sent in by friends or others. There is a hose to attach to water supply in case of fire. Lamps and kerosene oil are used for lighting.

No register is kept of inmates as to their habits, cause of dependence, mental condition, &c. The sick are treated in their cells, and nursed by other inmates, as there is no hospital. No witnesses have been detained the past year.

Prisoners are allowed to smoke and make ablutions in their cells. I remember, with pain, a visit I made to a prisoner, a couple of years since, who was confined for official malfeasance, and whose cell was ventilated so badly that the foul air from tobacco smoke and his own rebreathing made it impossible for me to endure it even for a few moments. He was suffering from palpitation of the heart and decided anemia, and gave a vivid description of symptoms plainly due to a vitiated atmosphere.

If prisoners are taken sick at night they have to knock and

call keepers. Prisoners are fed at a common table, and cells have iron bedsteads. Very little sickness occurs here. Outside the main jail, but in the building, is a cell containing, possibly, two thousand cubic feet of air space. I was informed it was customary, formerly, to confine tramps in this cell, and frequently they were packed in until they were crowded. This, without any means of ventilation except through a grated door, must have made it a veritable "Black Hole." The building is heated by steam.

MORRIS COUNTY JAIL.

This is situated in Morristown, and, as at Belvidere, is a part of the court house. It is built on soil of drift formation and constructed of brick and stone.

The walls are finished by plastering on the brick or stone; iron bedsteads are used. The cells open on an airy court, well lighted. So long as the jail is kept clean, a pure, natural ventilation is such that a sufficient change of air is had. The jail receives its water from the city pipes. As in the previous case, the sewerage system in vogue in Morristown, is by cess-pools. A large pool is situated just back of the jail and covered with plank and soil. The keeper has had considerable experience in prisons and understands the virtue of good house-keeping, and the general air of the jail was good. There is a water-closet in the back part of the jail, and he only allows the excretions of the body to go in this. Slops from bath tubs, &c., run in the gutters, and after emptying slops he flushes the gutters thoroughly with water, so as to cleanse them of all traces of slop-water.

The water-closet contains a trap but in spite of this foul gases are sometimes forced back through the trap into the jail. The keeper recognized the cause of this, and for this reason runs his slops in the gutter so as not to fill the cess-pool so rapidly, and thus force the gas to pass through the trap for an escape. If they will have cess-pools they should certainly run a pipe up to the top of the building as a ventilating pipe to it.

The health of the jail is reported excellent. The keeper says that the only sickness is from tramps and those brought there sick. In white-washing he insists on having the old scraped off and new put on.

Heating is by stoves. No regular dietary but a change is given. Medicine is furnished by the county on physician's prescription. No system of employment for inmates except cleaning up around; no tobacco furnished inmates. The prisoners' moral and intellectual welfare is looked after by the Y. M. C. A. and ladies who supply them with pamphlets and papers. No provision is made in case of fire. Lighting is by lamps. The sick are treated in their cells. Prisoners are allowed to smoke but not to wash in cells. There is no chance for change of air in cells but through doors, except in top tier of cells where there is hole 4x4 opening in attic.

One person was detained as witness during past year, but allowed to go around the grounds. No record is kept as to their habits, cause of becoming criminals, &c. Excretions at night are received in chamber vessels.

SOMERSET COUNTY JAIL.

Court house and jail are situated in a large square in the town of Somerville. They are constructed of brick and stone. They have to accommodate a large number of prisoners. Water supply is by well, for kitchen and drinking, and large tank at top of building for flushing sewer pipes. Sewage is conveyed by means of large pipes to a brook about a half mile from building. Sewer pipes are ventilated by pipes carried up to top of building. Water closets, &c., have traps. Sewers have good fall. Slop water is conveyed to a cesspool which leads to a gutter in the street; this they aim to keep well disinfected. Building is heated by stoves. No light allowed in the jail. Oil is used in court house and sheriff's apartments. No regular dietary, but a change is given as far as practicable. Medical attendance is had when called on, and medicines are procured at drug store on physician's prescriptions. No employment for inmates. No tobacco is furnished inmates. No witnesses have been detained the past year. Excretions at night are received in ordinary chamber vessels. Prisoners are allowed to smoke and wash in their cells. Ventilation is only to be had by natural methods, no provision made for change of air. No record is kept as to habits, cause of becoming criminals, &c.

UNION COUNTY JAIL.

This is situated in Elizabeth city and is a part of the Court House. The building is of stone and brick. The jail for males is a large court yard with cells in the centre abutting each other. This is, I may say, the common plan for jail and prison construction in this State. There is a bath room and water-closet in corner of jail. Warden keeps this thoroughly cleaned with lime, and it had a clean appearance and good smell. The water-closet arrangements seemed of approved pattern and effective working. Excreta pass into city sewers. These are not ventilated between traps and sewers. There is also a water-closet in the kitchen. Water supply is by city water and is brought on all floors of the Court House. They also have a well which they have to use in very dry weather as the city water at such times gets to smelling. The building is heated by steam. There is a regular dietary for each day, and a change in diet is given. Prisoners are fed at a common table. The jail physician attends whenever called on, and medicine is procured at drug store on his prescription. They report very little sickness and nothing that appears to originate in bad sanitation of building. No tobacco is furnished except to a few who work, and they get a little smoking tobacco. Building is lighted by gas. In the male part the court is well lighted and natural ventilation has a fair chance and besides there are air flues in the walls of each cell. The female part is constructed on the same general principles, but is so surrounded by buildings that a change of air is not so easily brought about through windows and doors. The air of this part on this account had a close smell.

Witnesses are detained in a room up stairs, but as this entails solitary confinement, they sometimes prefer to be put in with the other prisoners where they have more company.

Buckets with covers are provided for cell use. Lime is kept in these all the time, and they looked clean and pure. Prisoners are not allowed to smoke or wash in cells. The sewerage on the male side empties in a cess-pool, and from this into the city sewer. This has to be occasionally emptied, and should be permanently closed or frequently cleansed.

ESSEX COUNTY JAIL.

This is situated in the city of Newark, and, of course, they have to provide for a greater number and a different type of criminals than in agricultural districts. Essex county has a penitentiary, and as soon as the courts sentence them they are removed to this institution.

The general plan for arrangement of cells is the same here as in other jails, but much more extensive. Prisoners on their arrival are taken to a bath-room and given a bath. Bath-rooms and water-closets are kept clean and carefully inspected daily by the officials. Prisoners are required to do the cleaning of the jail. Whitewashing is repeated at frequent intervals.

The excreta are run into the city sewer, and the closets and sewers are kept well flushed. Separate apartments are had for detention of witnesses and for hospital accommodation. Heating is done by steam. Water supply from city pipes. Ventilation of cells by the usual method of air-flue between two cells and opening from each cell into the air-flue.

The principal sickness is from the tramp class or from those brought in sick. The warden appreciates the necessity of keeping everything clean and using plenty of lime and water to accomplish this purpose.

ESSEX COUNTY PENITENTIARY.

This is situated between Montclair and Caldwell. It was constructed in 1873–4, and receives the prisoners from the jail after their sentence, instead of sending them to the State institution. It is built of stone and stands against a gently sloping hill. On the top of the hill is the reservoir for reception, storing and distribution of water. The prisoners on arrival are received in a bath-room, and given a bath, and their height, weight and appearance taken. Their clothing is done up in a package and marked so that they can have it when they leave the prison. A prison suit is given them of striped clothing; underclothing is given them every two weeks; shirt, socks and towel every week. Coats, pants and shoes are repaired when needing it. Each cell contains wash basin and water closet, with free water supply, for flushing pipes. Besides this there is a bath-room in the prison for the use of the prisoners. Sewerage is disposed of by the

Waring method, and the receiving cess-pools are a couple hundred yards from the building. The sewers are ventilated by pipes leading up to the top of the building.

Water is supplied by large well and by springs, pumped from them into distributing reservoir. They have plenty of water for all purposes, but during the recent dry weather, when the whole country was short or water, they were forced to be economical with theirs. The physician in charge says that at no time have they had, apparently, any sewage gases entering the cells, unless it was when the water supply was low. He thought that the lack of plenty of water made itself felt by a close smelling air in the cells. This is important as showing the importance of plenty of water with the best sewerage system. The sewage formerly ran into a main pipe and then emptied in a creek at some distance from the building.

The doctor states that he found organic matter in the water of the creek, some distance below where the sewage emptied into it. When that system was in vogue, though they had no low diseases, yet he found a lower vitality among prisoners, showing itself by opthalmia trouble, &c; this has disappeared since the present system has been inaugurated.

The building is heated by steam, and cells are ventilated by the usual method. There is a hospital for sick, with ventilation openings in the floor, but no openings at top of buildings. A regular diet list is had for each day and they aim to provide a change. Medical attendance is arranged for by daily visits from the appointed physician. Medicines are furnished by the county and drugs are kept on hand, and room is provided in the building for them.

Deaths last year were three in number; one dropsy, one heart disease, and one brought there with typhoid fever died in two days.

Prisoners are kept busy at quarrying and breaking stone. The warden informs me that they almost invariably gain weight. The building is new, and if our present system of caring for criminals is the proper one, it certainly comes as near being the model institution as it can well be made. We can easily see that they should gain weight. With wholesome food and plenty of exercise, they can hardly help but be in good physical condition.

No tobacco is furnished to prisoners. A library is provided for their use, and religious service is held on Sunday. No register is kept as to habits, cause of committing crime, etc. Plenty of sunlight can enter the halls, and of course shine in cells. Night watchmen parade the halls, and if prisoners are suddenly taken ill, they can call the watchman.

AIR SUPPLY AND VENTILATION OF THE VARIOUS JAILS.

The air space of cells ranges from four hundred to five hundred cubic feet of air space for each prisoner in the various prisons visited by me. This is increased by the doors being of grating, and by opening on large halls. Ventilation of cells, when provided for at all, is by flues between cells, and carried to top of building. In many of these a lighted taper failed to show any current of air. As these flues are always small, and as these buildings are usually heated with steam, a current of air could be easily provided by carrying a steam pipe into the flue, and thus providing for a current of warm air continually.

Examination of air was had in nearly all institutions. The lime water test showed no impurities, but I have tested in cells that had a foul smell, and yet found no change, indicating that there are other impurities of the air than respiration.

CAUSE OF CRIME.

Any statistics that I was able to gather, concerning this important subject, were necessarily imperfect this year. No inquiry is made by officials into this, when prisoners are received by them. All keepers agreed, however, that intemperance is, of all things, the most fruitful cause of crimes. This is not strange, when we think of its well-known power of lowering the moral sentiments, and elevating the passions unduly. Undoubtedly the majority of these persons are born with selfish propensities over developed, and with limited ideas of their moral responsibility. This is not improved by their education. In the opinion of the writer, inheritance and intemperance should be considered together, for these persons are, as it were, on a pivot, liable to go either way. If they observe temperate habits, are steady and frugal, they will pass through the world as honest men and women; but if their education has been such as will

develop the passions, and create habits of intemperance, they will take the other side, and become criminals. They are evenly balanced when sober, but when stimulated with alcoholics, their moral sensibilities are loosened, and they easily slide over to wrong-doing, and thus commit many crimes against society.

In this manner alcoholics act as the exciting cause. The fact that they inherit low ideas of their moral responsibilities is the deeper cause. Thus alcoholics become the exciting cause of from seventy to eighty per cent. of all crime committed. I do not think this is putting it too high. One warden said that ninety per cent. of the criminals was made, so he felt sure, by alcoholics; he made this estimate after years of experience with this class. His experience here had been mainly with short commitments, such as occur in county jails, but he had been a keeper in a penitentiary and thought that this same percentage would apply there.

The deputy warden of the Essex County Penitentiary, who has been connected with that institution since it was built, and, prior to that, with the penitentiary on Blackwell's Island, N. Y., put the percentage much lower, but thinks alcohol is a fruitful source of crime. But this evident cause of criminals is worthy of the closest study by statesmen and legislators.

As to inheritance, though many criminals are such from birth, following the same line of criminality that their parents did, yet the masses of criminals, we doubt not, are recruited from the lower social classes.

Children born in tenement houses and educated in the gutters will have little inherited idea of right or wrong, and their education will drive out what little moral sensibility there is remaining. What can we expect but that these children will become criminals and dependents?

The writer could find but few facts regarding race. Intemperance, inheritance and education are the main factors to be considered in reference to diminishing the criminal classes. Regarding the latter, I do not think that mere intellectual education is all that is necessary by any means.

Unfortunately, society has not yet reached the point at which it is agreed as to the proper manner of cultivating the moral qualities, but it is just as much the duty of the State to do this

as it is to educate the intellect, and to do it for self-preservation. At the same time their physical nature should be looked after.

The work of the State Board of Health here makes itself felt. The better instruction of the people in sanitary laws, and self-care will, I doubt not, be shown in a few years in lessening the proportion of the criminal classes. The proper education of the child is to give it an "all round" education. While we are looking after its intellectual and moral education, its physical should be looked after as well.

Therefore, it is the duty of the State to provide for the education of its children into the laws of their physical being. After the care of self and after reading and writing, the first thing taught should be physiology and hygiene. This may seem sentimental and ahead of the times, but that it would lessen criminals, I feel sure.

In the prisons visited by me I think I always saw evidence, on the part of the officials, of diligent effort to keep their charges in good sanitary condition. There might be some improvements made in all the prisons visited, in some sanitary details, and in the construction of buildings; but in all there was good house-keeping, and the absence of disease spoke well for their sanitary condition. The officials of the Essex County Penitentiary should be commended for their prompt change in sewage disposal, when they found that the original plan was inefficient. Unfortunately committees and other governing boards are not always so prompt in making needed changes, for fear of losing votes at the ensuing election.

If the present plan of confinement and punishment is the proper method for caring for criminals, then I have but few suggestions to make. A plentiful supply of water and lime and good food will make up for many deficiencies of modern sanitary appliances. Of course such a condition of sewage pipes as exists at the Warren and Morris county jails should be at once remedied (where sewage passes into tight cesspools and these as well as pipes not ventilated) but this is the fault of jail committees and not of the jailers. It may be that all of our care of criminals is defective. While it cares for them and punishes them, yet it might be well to inaugurate a method having more reference to the cure of their social condition and the prevention

of crime in the future. That this will be the method of the future we do not doubt. The education of the youth properly belongs to the public instructor, but after they leave his care, it might be well to have some system of visitation that would look after young persons who are committed for the first time for some light offense, as drunkenness, vagrancy, assault and battery and petty thieving.

The plan I suggest would also look after the discharged prisoners, seek for them employment and help to make them respectable citizens and to forget their past life so far as possible. The medical profession is recognizing the great importance of preventing disease in order to prevent crime, and are studying side by side these great social problems, which have for their aim the physical, moral and industrial elevation of the masses.

ALMS-HOUSES.

In country districts these buildings are often situated some distance from towns, and are, therefore, not subject to the frequent inspections that jails receive. Among many officials there seems to be almost an opinion that anything is good enough for the pauper. This is not true, according to my experience, of the official having direct charge of those people, but it is true of the governing boards in many instances. The sanitary condition of alms-houses will not compare at all favorably with the jails. The latter are far better constructed and better provided with sanitary appliances than the poor-houses.

WARREN COUNTY POOR-HOUSE.

This is situated on the road leading from Hackettstown and Port Murray to Belvidere. There is a large farm, which is worked by pauper labor principally. The building is old, having been built many years ago. Some one hundred feet from the main building there is a two-story building of more recent construction, which serves as dormitory for some of the men.

The inmates in the summer get reduced to less than ninety. In the winter they are added to until over one hundred and

twenty have to be accommodated. It will accommodate eighty or ninety inmates quite comfortably, but as built and arranged it is not adapted to hold over seventy-five. In a letter to the Washington *Star*, of January 23d, 1880, I made a detailed report on the sanitary condition of the house. At that time there was one hundred and thirteen inmates. This made less than three hundred cubic feet of air space for each inmate. No provision is made for ventilating rooms other than by valves over the doors. These are sadly insufficient for the purpose. In addition to its overcrowded condition, the building is heated by stoves, and not only is the air consumed by the inmates, but by the stoves. These are cared for by inmates, and the amount of coal gas thrown out generally by each of the stoves is fearful to contemplate. I give the dimensions of one room, on the men's side, of the foul condition of which I have a vivid remembrance:

It is room No. 2 containing nineteen hundred and seventy-five cubic feet of air space. One stove, two windows, one door, six inmates, three hundred and twenty-nine cubic feet air space per inmate. Very close. Nine thousand and fifty-four (9054) respiratory impurity per one thousand volumes. This room is invariably foul. It is used during the day as a sitting room and smoking room, and usually in cold weather there are ten or twelve sitting in it, making less than two hundred cubic feet of air space per inmate during the day. There are here a couple of old men chiefly confined in their beds. I have noted the fact that these inmates complain more during cold weather than during warm, when they can be out. The stove here gives off great quantities of carbonic oxide, which decidedly helps to make the room unbearable to those used to pure air."

I was the attending physician for two years. In the winter time, when doors and windows were closed, I could not stand it in this room at all; it could only be appreciated on being inhaled. The truth is that the ventilation of the whole building is as bad as it well can be, and in the winter months it is much overcrowded. The mortality to children was great during my attendance. In case of sickness in adults or children, the vitality would be so much lowered, and this, combined with foul air, made it almost impossible to rally them. The Steward was par-

ticular in keeping the house well cleansed and whitewashed, and this, I believe, prevents an outbreak of septic disease.

The water-supply is by a spring, about seventy-five or one hundred feet north of main building this is lower than basement of building a few feet further on, and on six or eight feet higher ground, is situated the privy. On first glance, this would seem criminally close and in just the position to contaminate the spring; practically, however, this seems never to have occurred, and the lay of the ground would seem to carry all drainage in a direction from the spring. Recently, the authorities have brought the water from the spring down into the house, and it is hoped they will soon distribute it through the house.

The present management have arranged the privy so as to remove its contents and spread on the soil every few weeks or months. Still the chances for contamination of spring remain, for it is difficult to tell how many crevices may be in the rock and what direction they may take. This privy vault may have contaminated the soil for many feet around. A large spring against the hill, a quarter of a mile from the house, could be easily conveyed to and through the house.

Slop-water from the kitchen is thrown into drains in front of each kitchen door. The soil is of gravel drift, and the drain leads some distance down the hill and empties itself into the soil. This provides quite efficient disposal of kitchen waste by irrigation. Excreta is emptied in a privy vault, from which it is spread on fields. Ordinary chamber vessels are in use for the night time and for the sick. The need of more space, better ventilation and more water-supply is sadly felt.

The children are sent to school at the public school about a mile distant. Places are found for them as fast as possible. The arrangement of the building and its overcrowded condition make it impossible to separate the sexes entirely. Every effort possible is made to keep them apart, but they succeed in getting together at times. I clip from my letter in the *Star* the following, which tells its own story:

DEATHS.

Deaths from June, 1878, to January, 1880	16
Those having one or both parents paupers	6
Percentage of those dying having pauper parents	37.5

BIRTHS.

Number of births from June 1, 1878, to January 1, 1880..	6
" " conceived in the house......................	3
(These conceptions took place prior to present management.)	
Percentage of births that were conceived in the house......	50
Percentage with Irish parents..................................	66.6
Percentage of illegitimate..	16.66

(The small number makes the above of but little practical value.)

STATISTICS OF WHOLE NUMBER IN THE HOUSE.

At present in the house..	113
Conceived and born there..	8
Born there...	16
Having pauper parents, one or both..........................	32
Foreign born—Ireland, 25; Scotland, 2; England, 2; Germany, 5..	34
Native born..	79
Percentage of inmates conceived and born in the house...	7.07
Percentage of inmates born there............................	14.15
Percentage having pauper parents, one or both.............	28.31
Percentage foreign born..	30.08
Percentage native born	69.91

STATISTICS OF ADULTS IN THE HOUSE.

Adults in the house...	84
Adults conceived and born there..............................	2
(In addition to this there are a number of doubtful cases.)	
Adults having pauper parents, one or both..................	6
(All the foreign born deny it, as a matter of course.)	
Percentage conceived and born there........................	2.38
Percentage having pauper parents..............................	7.14
Percentage to whole number in the house....................	74.33

STATISTICS OF CHILDREN IN THE HOUSE.

Number of children in the house..............................	29
Number of children born there.................................	14
Number of children having pauper parents, one or both,	26
Number whose parents are both there now....................	11

Number of children conceived there	6
Number of children of illegitimate birth	12
Percentage of children to whole number of inmates	25.66
Percentage of children conceived there	20.68
Percentage of children born	48.27
Percentage of children that had pauper parents, one or both	89.65
Percentage of children that are illegitimate	41.37

MORRIS COUNTY POOR-HOUSE.

This is situated two or three miles from Boonton, and the county owns there a farm of two hundred and forty acres. Building is of wood, and the main part is old, and though in good condition outwardly, the walls and floors are poor.

There is a new building, perhaps seventy-five feet from the main building, and this serves as a dormitory for men. There is provided from five hundred to six hundred cubic feet of air space per inmate; no arrangements are made for change of air other than by openings over doors and through windows and holes in ceiling opening in attic. The air of the new part seemed pure, but in the old or main building it was close and had a bad smell. Air, however, on my visit showed no excess of carbonic acid gas. Rooms are frequently and thoroughly whitewashed, but in spite of this the general air is bad, indicating that a thorough remodelling of the building is necessary. Kitchen slops empty in pipes leading to a creek, possibly two hundred feet distant. Privies, with vaults under them, receive the excreta; these are emptied every few months. No indoor water-closets are provided; chamber vessels are used for night use. There are a couple of closets in the house in which buckets are kept for use of inmates, and these they are required to remove daily and cleanse.

The old building had originally vaults under one side of it so that each room on one floor of that wing had a privy adjoining it. This became so great a nuisance that these vaults were filled in some years ago and the lids of the privy holes screwed down. Water is supplied from four wells; in the wash-room of the new building water is led in by pipe from a reservoir.

Iron bedsteads are used. A portable bath-tub is in use for inmates. They are fed at a common table. Cellars are under

nearly the whole building. Some difficulty has been experienced in keeping meat in one of the cellars. Water does not come in the cellars and they were clean and well aired.

Three ward-rooms have fire places. Heating is done by steam. No regular diet list is had, but a change is provided. There are five insane paupers and eleven demented or foolish. All are considered harmless, and they are not kept separate, but the Steward thinks they should be. Male and female are locked in separate apartments at night, but mingle freely together during the day. Steward believes this should be different, and that they should be kept separate at all times; but he could not well do this in the present building. With the exception of having more space, this institution is not near so well arranged as the Warren County Poor-house.

The children are taught by a pauper in the building, and they are bound out as soon as places can be had. The attending physician states that they have had "no diseases for many years directly traceable to sanitary defects."

Inmates are required to work on farm and garden when able. Tobacco is furnished to about thirty. Kerosene lamps are used for lighting. No register is kept as to habits, cause of dependence, mental condition, &c.

ELIZABETH CITY POOR-HOUSE.

This is situated on the border of the salt meadows, just out of Elizabeth city limits. It is built of stone and brick walls are hard finished.

Most of the children are vaccinated, but it is not seen that they are vaccinated when they are brought in. Iron bedsteads are in use. Bath-rooms are provided for inmates. Sewage runs in pipes and empties about two hundred feet from building, on the salt meadows. Buckets are in use in case of sickness.

Privies are in use out of doors, and excreta drops in vaults. These are cleaned every winter, but not ventilated. Water-supply is by well and cistern. Heating is by steam.

The average number last year was forty. There are three insane paupers. An inmate's arm was broken a couple of years since, by an insane pauper. As far as possible, the sexes are kept separate. Medicines are kept in the house, and a phy-

sician visits them every two days. Tobacco is furnished to those that use it.

No arrangements are made for schooling children. As soon as old enough they are put in the various asylums. Kerosene oil is used for lighting. No register is kept as to habits, course of dependence, &c. Over one-half are foreign born.

Heating is by hot-air furnaces, and ventilation is through windows and doors. The house, at time of my visit, was certainly not crowded, and air of apartments was pure, so far as sense of smell was concerned.

Paupers are required to work on the farm and garden when able. The institution is reported healthy.

ESSEX COUNTY POOR-HOUSES.—NEWARK CITY ALMS-HOUSE.

This is situated on the Elizabeth avenue and adjoining the salt meadows, and at extreme end of city. Buildings are owned by city, and are built on sand and gravel drift. City has here about thirteen acres of ground, which are used for most part for trucking. Building is constructed of brick; originally erected about 1840, and rebuilt and enlarged 1868. All children are vaccinated. Iron bedsteads are in use.

Inmates, on their arrival, are given a bath, and their clothing is boiled and pickled in alum and hot water to destroy the vermin. The steward says that he had great trouble to keep vermin out for a while, but they stopped the rolling up of old clothes and putting them under the pillows, a custom very common with this class; since that time, by observing strict cleanliness, there has been little trouble with vermin. Every inmate is required to take one bath every week. Inmates are fed at common table.

All sewage runs in city sewers; all openings are well trapped. There was formerly a large vault under the centre of the building, and water-closets over it. There was a well about sixty feet from vault, and a gradual slope from vault to well. The present management had this vault carefully cleaned and filled in with dry earth. This was five years ago, and at that time the well-water had bad taste and there was a smell from privies through the house. Then was inaugurated the system of sewerage now used, which remedied the evil. The Steward and Governing Board has aimed to have all sewer openings well trapped. Sew-

ers are ventilated only by openings where surface water runs in, and are ventilated also by tin pipes carrying roof washings in the sewer.

The average number the past five years (since present management came in) has been about the same.

Death rate in 1875 was at the rate of 78 per thousand.

Death rate in 1876 was at the rate of 54 per thousand.

(This was after vault was cleaned and sewer put in.)

Death rate in 1877 was at the rate of 48 per thousand.

Death rate in 1878 was at the rate cf 28 per thousand.

Death rate in 1879 was at the rate of 23 per thousand.

The Steward attributes this (and I think correctly) to the improved sanitary condition of the house. During this term the yearly average was about two hundred. This being the case, we find a reduction in the death rate of the house from thirty-nine per cent. to eleven and five-tenths per cent. Certainly this reduction is worthy the study of some poor-house officials, who think sanitary authorities are visionary when advocating improved sanitary measures. I think the above figures tell their own story, and that the moral is plain. Ventilation is by fanlights over doors, and halls have ventilating opening through ceiling, and ventilators on roof. At my visit I found the air of rooms good, and they were not in a crowded condition.

The water-supply is from city water-works; there is a receiving cistern in the attic. There is also a well which is used some for cooking purposes. The city water can be used by using from storing tank in the attic or directly from city main. Steam is used for heating purposes.

A change of diet is provided and fish is given on Fridays. A number of harmless imbeciles are kept here, and the Superintendent thinks it not essential to keep them separate.

Sexes are kept in separate apartments, and while out of doors a high board fence separates them. Nursing of the sick is by inmates. Medical attendance four or five times weekly, and oftener if necessary. Medicines are furnished by the city on requisition of alms-house physician. Officials complain that the alms-house is made the receptacle of nearly all the incurable poor from their hospitals.

The need of Newark seems to be a city hospital for the poor. No hospital is provided in alms-house, but a room is provided

as lying-in room for women. Inmates are required to work on the farm, trucking, &c. A few have tobacco furnished them. Children are sent to public school near by, and they are apprenticed out when places can be had. About twenty were born in the house last year.

Oil is used for lighting purposes. No register is kept as to habits, cause of dependence, mental condition, &c. Although there are many errors in construction of building, &c., yet this institution is, in its general condition, far superior to the average poor-house.

Franklin township, Essex county, supports its poor at the Belleville poor-house, but the greater portion of its poor is given out-door relief by its Overseer of the Poor. They have but one in Belleville poor-house, for which they pay two dollars per week. Overseer said he had about thirty to whom he was giving relief. Of twenty out of these thirty, the cause of their dependence was either directly or indirectly to be found in alcoholic drink.

Belleville township has a poor-house. Overseer of Poor has control of it, and lives about one-quarter of a mile from it. It had seven inmates on my visit, and the overseer furnishes food and fuel and other necessaries, and they keep boarding-house for themselves. The overseer has been the same for very many years. Says house has usually been healthy since the typhoid fever prevailed, twenty years ago. Most of sickness is brought there. Children are bound out as soon as proper homes can be found. Of the seven in the house, four were Irish born, two American and one English. The overseer thinks debauchery and dissipation the most frequent cause of pauperism, and says he estimates eighty per cent. of paupers are made so by drink.

Bloomfield township has an alms-house, but they aim to help, by out-door relief, as far as possible. At my visit the house was closed and I did not inspect it.

Montclair gives out-door relief, and has poor-house which has an average of ten inmates. It is under the control of the Overseer of the Poor. The building is on a lot, or small farm, and is like many cheap farm-houses; everything about the house was neat and clean, and while here, I felt strengthened in my belief that to scatter the poor, and each township to care for its own in

small buildings, is, after all, the better way for agricultural districts.

Inmates here are not allowed to leave the premises. The overseer thinks this works well, as they do not like the confinement and are apt to seek work.

They have a room set apart for the sick, and this contains an earth commode. There is an out-house for lodging tramps where they are put without pipe, tobacco or matches, and they are given but little to eat.

GENERAL REMARKS.

To my question asked Superintendents and Overseer, "What do you consider the most fruitful cause of pauperism?" the reply *always* came without hesitation, "Drink." This was estimated as the cause of from sixty per cent. to seventy per cent. of pauperism. Taking the opinion of all the men having charge of alms-houses, jails, and out-door relief and with whom I came in contact, I am safe in saying that at least eighty per cent. of crime and pauperism, is due to alcohol. The Steward of the poor-house, at Elizabeth, gave me a case to the point: A man with wife and four or five children, a workman in Singer's Sewing Machine Manufactory, able to earn thirty dollars per week, became so dissipated that at last himself and family became inmates of the poor-house. Although not a member of any teetotal organization we are forced to admit that *alcohol is the cause of by far the greater proportion of crime and pauperism.* It has a more direct relation with pauperism, than with crime. In men of bright intellects, alcoholics elevate the passions and debase the moral sentiments, and crime is the result. In the lower ranks and among men of low intellects, though it has the same action, yet they do not become criminals, but all shame and sense of degradation is lost in the desire for drink, and they become paupers. The aim of alms-houses seem to be to give a home to the unfortunates who are forced by reverses to become dependent on charity.

In reality, they are the home for the low debauched. Race becomes more prominent when we consider pauperism than in considering criminals. Inheritance undoubtedly plays an important part in the production of pauperism. A year ago, in the Warren County Poor-house, I found over twenty-eight per cent.

had pauper parents. (See figures above.) I believe the proportion will fairly hold out over the State. Venereal diseases have been quoted as a cause of pauperism, but I am inclined to consider them the result rather than the cause of pauperism.

So far as my inspection is a criterion then, it shows that the system for indoor relief in this State is to care for those becoming dependent, and has no reference to present or future prevention. This seems a vital error. Full statistics should be kept so that accurate knowledge could be had as to habits, cause of dependence and mental condition. As to sanitary condition, without doubt, they are, upon the whole, bad. The only reason that septic diseases are so few, is, no doubt, due to the cleanliness and strict oversight of the Superintendent.

In the city of Newark, the Overseers of the Poor have full charge of out-door relief; they make visits and inquiries before extending relief, give coal, bread tickets, and a little cash. Overseer thinks this much better than orders on groceries and market. The careful oversight of Overseer seems to have materially lessened cost of out-door relief. Economical out-door relief, with some provisions for in-door relief, seems to be in accordance with the most enlightened views on the subject of pauper relief. The buildings for reception of paupers in counties visited by me, are arranged with little reference to the needs of such institutions. The writer favors the cottage or pavilion plan, but the model poor-house is not in these counties.

A question of vital interest is the tramp question. I was agreeably surprised to find a unanimous opinion among officials that something should be done to lessen the amount of crime and pauperism. The matter is worthy of the closest scrutiny by legislators.

With carefully-collected statistics, and with popular opinion aroused, this State could revise its poor laws, and in other ways do much to not only better the condition of the paupers and criminals, but what is far more important just now, do a great deal to lessen these social disabilities. In some of the public institutions improvements could be readily and economically made in sanitary measures, but for the most part the governing boards of these institutions are little acquainted with sanitary laws, and these are made secondary to other considerations.

The many thousands spent for poor relief in this State, should

be lessened in some way. A very large proportion of our pauper population is of foreign birth. Some measures taken by our National Government to limit this class of emigration would no doubt benefit the tax-payer.

The measures taken to diminish crime and pauperism go together. The care of insane paupers by the counties themselves, instead of caring for them at the State institutions, is at tracting considerable attention. I frequently had the lessened cost to Essex county quoted to me and visited the Insane Asylum at Newark. If other counties will provide equally good accommodations and supervision, I should advocate the scattering of our pauper insane, but to take them from the comforts of a well-regulated State Asylum to some of our poor-houses would be actual cruelty. Many forget that the needs of Essex county, with a large city and its populous suburbs, are different than the needs of an agricultural county like Morris and Warren.

What has already been said regarding education, when treating of the criminal classes, will apply as well to to the pauper classes. Though our overcrowded poor-houses should be relieved, and many changes made in their sanitary arrangement, as well as in that of the jails, yet I feel assured, the really important thing for public spirited citizens of our State to consider, is more enlightened methods for the care of these classes that their numbers may be diminished, and that those once discharged may not again become criminals or paupers.

In conclusion, I should like to express my thanks to all the officials with whom I have met. I was treated with uniform kindness, and not only allowed to make inspection, but had extended to me valuable assistance in many of them, while closely following existing methods, yet express themselves defective. If, at any time, it should be deemed advisable to gather more accurate statistics regarding this vital subject, none will more heartily concur than these officials, many of whom will be able to give valuable hints.

The jail of Middlesex county was examined by the Secretary of the Board and found in good condition, with a few minor exceptions.

The description of Warren county Alms-house well applies to that of Camden county, which will be noticed in the next report.

LOCAL HEALTH BOARDS.

WHAT THEY CAN ACCOMPLISH IN THE INTEREST OF PUBLIC AND PRIVATE HYGIENE AND SANITATION.

BY H. A. HOPPER, M. D., HACKENSACK.

If the diffusion of knowledge pertaining to private, and through it to public health, be the lever by which communities can be moved in the direction necessary to secure their present and prospective comfort, it becomes plain that the domain of the local health board is not alone the correction of existing evils, but the use of all legitimate means within reach to inculcate the the truth that *preventable* diseases cause a large share of the discomforts and sufferings of the human race. As sanitary science progresses and opens up new fields for investigation year after year, new demands are continually being made for the development and utilization of the best methods to be employed, in the application of newly discovered scientific laws, to the daily requirements of domestic and public life. Health Boards are at present the recognized instruments for the emergencies of the situation.

It may be safely said, what the unit is with its fellow in the statement and solution of a mathematical problem, so also is the relation of a properly organized Local Board of Health to the value and efficiency of both State and National Boards, in the collection of data for the intelligent and satisfactory enforcement of all sanitary regulations within their jurisdiction. It is a self-evident proposition, that all circumscribed areas of human habitations have their especial wants, which are best understood by the intelligent observer, whose constant association with a particular population and their habits of social and domestic life, and whose knowledge of topographical and prevalent meteorolog-

ical influences enables him to estimate the especial needs in such localities. Special commissions of investigation must frequently fail of accomplishing the object of their creation, where either ignorance or indifference and often the opposition of prejudice withhold needed information, or interpose obstructions to the pleasant working of public machinery. The value and importance of a Local Health Board cannot be over-estimated if the true spirit and object of its work be appreciated, both in relation to home improvements and the collection and summarizing of correct data for the annual report of the State Board. To render such service in keeping with its importance, the Local Board must at its earliest opportunity, push forward the work of making a sanitary map, by actual survey of the territory within its jurisdiction, defining the topography, including sub-soil advantages for draining, together with notations of changes which have been made, or which should be made, by the filling in and obliteration of water-courses, suggestive of the requirements not yet met, and in all matters to study and define the specific demands of such locality, growing out of the sanitary relations of the population to the soil covered, and to be covered, by their habitations. Social and domestic habits can be pretty effectually learned without intruding, offensively, upon individual rights. Exposures of unsanitary conditions connected with the dwelling are so frequently spontaneous, that they make their own suggestions. A surface house drain reveals itself by projecting its waste beyond the house enclosure, and by its offensiveness calls for the attention of the Health Board. The neglected cesspool and privy vault regale the nostrils, and cry out for relief. Many other tacit exposures of domestic indifference and carelessness, attest the value of corrective supervision. The duty and work of the Local Health Board appears plainly to be first to learn the necessities of the population which dwells within its jurisdiction, and then to devise the most prudent, as well as the best means to meet such necessities; but in the exercise of authority, to make it successful, rather by the force of sanitary education, than by the exhibition of imperious power; always tempering the corrective with something of the "*argumentum ad hominum,*" persuading by appeals to selfish impulses, if need be, including the argument for the protection of self and home, that private interests may be made subservient to the public weal.

When recourse must be had to legislative power, in the event of other failures, let the broadest construction and application be made without reserve.

The foregoing treatment of the subject is rather a generalization of its importance than a detail of the practical work which it suggests. For example, the importance of a private system of drainage for every home must be insisted on, and when hesitancy or delay retards the necessary improvements, the local board must point out the necessity and establish a system applicable to individual cases, without regard to special locality. The danger of allowing garbage or wash waste from houses to be thrown carelessly on the surface, or to be conducted into a badly-constructed cesspool, must be met by instruction, or by ordinance compelling the abandonment of the one and the construction of both cesspools and privy vaults with water-tight bottoms and side walls, to avert the danger of well-water pollution; and so to apply a system of pipe ventilation that atmospheric poisoning may be prevented inside of dwellings.

Another subject imperatively within the province of the local board, is the important one of particular supervision of public buildings, both as it relates to the method of conducting sewage matter from such buildings, the mode of heating, and the application of the best-known methods of ventilation to all the apartments of those structures.

In this category must be placed court rooms and jails, when they are within the limits of control of the board. Hotels for the accommodation of boarders, churches and public assembly rooms of any kind, and notably school buildings, which are not to be passed over with an inspection as to general plan, but should include the detail of examining class-rooms, in relation to ventilation, as it may be applied to the requirements of an average number of pupils occupying such rooms during school hours. From the local board should emanate suggestions to principal and teachers for the detection and stamping out of contagious and infectious diseases when they make their appearance in the school. Where vaccination has been neglected, no better opportunity for the discovery can be found than by the roll-call from the teacher's desk. The application of our State laws, as provided for in such cases, becomes a comparatively easy matter by such supervision.

Verbal advice, judiciously given by an authorized committee from the local Board, will accomplish great things by challenging attention to the constant neglect of the plainest, as well as the most intricate laws of public and private health, but in addition to this, recourse should be had to the local press whenever the columns of a newspaper can be employed, to reach a larger number by the discussion of subjects pertaining to the sanitary needs of your people. At stated periods printed circulars should be distributed, containing health ordinances for the guidance of all concerned in the promotion of the best sanitary interests of the community, both general and special.

Appended is a specimen of the plan, indicated in the above consideration, which has been found to work admirably under the direction of the Board of Health of New Barbadoes township, especially in its application to the town of Hackensack, N. J., where, in the period of six months, neighbors who were for a long period of years indifferent to each other's surroundings, have become vigilant advisers for their mutual benefit.

CIRCULAR OF THE BOARD OF HEALTH OF NEW BARBADOES TOWNSHIP.

At the last session of our Legislature, particular attention was given to the pressing wants of the people of the State, looking forward to a more perfect system of sanitation for both town and country. Laws were enacted for the compulsory organization of a Board of Health in every township in the State.

Under the provisions of the laws alluded to the township of New Barbadoes has organized our Board of Health, and we now appeal to the people of the township for your co-operation in carrying forward a work which is in every way calculated to secure a better and more permanent condition of the public health.

At the outset we are thoroughly impressed with the importance of the truth that a proper education of our people in sanitary matters lies at the foundation of a successful enforcement of that system of individual restraints which is the great factor in making up the sum of community profits from a well-regulated public hygiene.

So many sources of atmospheric and water pollution exist in every community unheeded, that familiarity with their presence begets an indifference to the fact that, every week and month of the year, such sources of danger to health and life are multiplying; and unhappily the force of this truth is often realized only when some devastating pestilence numbers its victims by dozens, and sends distress and mourning into as many households.

As the preventive is always more satisfactory than the remedy, we desire to call your attention to some of the more common and unsuspected causes of bad health, and advise their immediate removal by individual effort, in order that the powers conferred by law may not be required for coercion by the Board of Health:

Outside of dwellings, badly constructed and much neglected cesspools and privy vaults pour out the poisonous gases of organic decomposition to vitiate the atmosphere you breathe in your houses, while through their uncemented bottoms streams of corruption percolate the soil and find the outlet for their polluting matter—held in solution or suspension—in wells which supply families with water for drinking and cooking.

As the season is advancing and summer will soon follow spring with increasing high temperature, when putrefactive decomposition of waste matter is certain to be rapidly increased, it is the part of wisdom to begin at once our efforts for the removal from our houses of every source of such contamination.

We call your attention to some advice given by our State Board of Health in the following paragraph:

"Look to the condition of your house. Begin at the cellar or basement. Have nothing there that can decay or that causes foul odors. If damp, let in air or sunlight; or drain the surroundings if needed. If by cleansing by whitewash, or by repeated airing, there is not agreeable air, speedily use some disinfectants. Look to the kitchen; let all sinks be kept sweet by scrubbing, by hot water poured down every day or by the free use of disinfectants when needed."

Be sure that the sink is properly trapped and that a ventilating pipe is carried from the waste pipe of the same size, to the top of the building and above it.

Have the dwelling and sleeping rooms well aired every day; shake up the bed clothes freely every morning after sleeping in

them, and air them well by windows widely opened so that free ingress may be given to outside air, in order that organic particles, which would otherwise accumulate and cause atmospheric pollution, may be neutralized and driven out.

In your attention to the out-door arrangement of your home—see to it, first, that the privy vault and cesspool are not in too close proximity to your own or your neighbor's dwelling; second, that it is constructed with masonry, water-tight in both side walls and bottom; that filth accumulations may be thoroughly removed at stated periods—and pollution from such sources of your own and your neighbor's water-supply may be prevented.

Both of the filth receptacles just named should be supplied with ventilation high enough to avoid throwing offensive gases into your own or your neighbor's windows.

In all cases where new vaults are built, the old one must be thoroughly cleaned before being filled with earth. All these conditions will be strictly enforced in the future.

To avoid future complaints to, and attention from the Board of Health, it is suggested that immediately after the present cleansing, tight bottoms be made to all filth receptacles.

Any suggestions needed for sanitary management will be freely given by the Advisory Committee of the Board of Health. H. A. Hopper, A. S. D. Demarest, M. W. Heath.

A list of the best and cheapest disinfectants may be had at any time from the same source.

H. A. Hopper, M. D.,
President and Medical Superintendent;
M. W. Heath, *Vice President;*
H. H. Zabriskie, *Secretary;*
A. S. D. Demarest, *Treasurer;*
John Schmults,
Board of Health of New Barbadoes Township.

SECRETARY'S SUMMARY OF REPORTS

FROM LOCAL BOARDS OF HEALTH, WITH COMMENTS.

One hundred and eighty-seven formal reports have thus far been received by the State Board from local boards.

Twenty-six more report boards as formed, but they have had occasion to do so little that no special report was rendered. A few townships, understanding the law to be permissive and not compulsory, have failed to organize. It is believed that another year will witness the formation of boards in all townships and towns of the State. While in some there will be need of very little service, it is the right of every citizen to have thus a constituted authority to which to appeal in case of need. Besides the existence of such a board leads its members, as well as others, to be more inquisitive as to matters which concern the public health. This is sure to result in greater intelligence as to the avoidable causes of disease. No one could read the reports received, and some of them from very sparse districts, without recognizing that the subjects of inquiry are many, and that needs may arise for oversight in localities which seemed protected.

The form of schedule sent out was as follows:

ANNUAL REPORT

Of the Local Board of Health of (city or township)................. county of...................................for the year ending October 1st, 188

NAMES AND POST OFFICE ADDRESS OF MEMBERS.

....

....

SCHEDULE OF SUBJECTS FOR REPORT.

A. Location, population and climate.
B. Geology, topography and contour.
C. Water-supply.
D. Drainage and sewerage.
E. Streets and public grounds.
F. Houses and their tenancy.
G. Modes of lighting.
H. Refuse and excreta, (how managed.)
I. Markets.
J. Diseases of animals.
K. Slaughter-houses and abattoirs.
L. Manufactories and trades.
M. Schools and school and other public buildings.
N. Alms-house hospitals, and other charities.
O. Police and prisons.
P. Fire guards.
Q. Cemeteries and burial.
R. Public health laws and regulations.
S. Registration and vital statistics.
T. Quarantine or care over *contagious* diseases and vaccination.
U. Sanitary expenses.
V. Heat and ventilation for dwellings.
W. Health conditions of the year.

Other subjects may be named under X, Y, Z. The subjects may thus be referred to by the letters.

If the sheet provided is not sufficient, add others, marked with the letters which designate the topic treated.

A.

B.

This order has been carefully adhered to by most of the Boards, with much additional information in some of them as to present condition of health or local evils.

The amount of information returned was far greater that had been anticipated, and if printed in full would be of permanent value to the State.

On some of the subjects collateral to health interests, such as A, B, F, K, L, M, N, Q, etc., we have collected a body of definite information of much value in any statistical inquiry into matters of local conditions, prosperity and local development. On matters relating to the public health, the information is far more extensive, reliable and instructive than any heretofore collected. It is the purpose of the Board so to complete this as to make it accessible to citizens who would closely estimate the material desirability, development and healthfulness of the State.

We desire to make acknowledgements of indebtedness to all these Boards who have so fully and faithfully responded. It is impossible to publish all the material thus furnished. We shall only seek by a few specimen reports and by abstracts bearing on particular subjects to show how important is the full information thus secured.

The reports of Newark and New Brunswick will be given in full as specimens of valuable city reports. A few townships will be selected as models in the same way. From others we can only cull a few sentences, and pass many only because there is no specialty of condition or disease requiring our immediate notice. We ask careful attention to these brief notices, as many of them refer to valuable points in local needs or local experience, and so help all in the study of health matters.

After the full reports of Newark and New Brunswick, the rest will be given in the order of counties.

REPORT

OF THE BOARD OF HEALTH OF THE CITY OF NEWARK, NEW JERSEY, TO THE BOARD OF HEALTH OF THE STATE OF NEW JERSEY, FOR THE YEARS 1879 AND 1880, ENDING OCTOBER 1, 1880.

BY CHARLES M. ZEH, M. D.

In compliance with a request of the State Board of Health, the Health Board of the city of Newark, N. J., present the following

REPORT:

The Board of Health of this city is composed of the Mayor, who is President of the Board, the Health Physician and the members of the Committee on Public Health, of the Common Council.

The members of the city Board of Health for the present year are: William H. F. Fiedler, Mayor, who is their President; Isaac A. Nichols, M. D., Health Physician.

Alderman MARTIN B. PROVOST,
PIERSON G. DODD,
JOHN S. CLARK,
Committee on Public Health.

A.—LOCATION, POPULATION AND CLIMATE.

The City of Newark is situated on the west bank of the Passaic river, about eight miles from the City of New York, in the county

of Essex. Its nothern boundary is the township of Belleville and one of the great flexures of the Passaic; on its west lie the townships of Bloomfield, East Orange, South Orange and Clinton; on the south are the townships of Clinton, Elizabeth City and Newark Bay. The Passaic River and Newark Bay form its eastern boundary.

The population includes nearly all nationalities, and by its easy access to New York City, furnishes pleasant homes for a large number of people who transact business there.

Its climate is mild and temperate, having an average temperature of 51.75°—its high range is 100°, and its low range, zero. Its rain fall during the year has been 44.6 inches. With a few exceptions it is delightful and healthy. During seasons when easterly winds prevail, catarrhal difficulties are aggravated by the moist salt air, and in the latter part of summer malarial troubles are increased by miasmata emanating from the great salt meadows, which lie between this city and the city of New York. These cover an extent of ten or twelve miles in length, and seven miles in width, with a soil composed, almost wholly, of vegetable matter, at all times saturated and partly covered with fresh water, which undergoes rapid evaporation and decomposition the effect of which is experienced in the upper portion of New York City and Long Island when westerly winds prevail. The recent diking of these meadows, preventing salt water from flowing over them, which would naturally retard fermentation and decomposition, may possibly be charged as the cause of any excess of malaria here, and for twenty miles or more around us, over that of the years preceeding the diking.

B—GEOLOGICAL.

The soil of the city is composed of red and yellow loams and sand, alluvium and drift, sandy clays, trap rock, shales and conglomerate red and brown sandstone, from which are quarried large quantities of brown stone, of a superior quality, used here and elsewhere for building purposes.

TOPOGRAPHY AND CONTOUR.

In general outline the city is very irregular. Its easterly, northerly, and southeasterly line conforms to that of the Passaic

river and Newark bay. Its longer axis is northwest and southeast. The older settled portion of the city lies about twenty or thirty feet above the sea and river. Thence westerly, quickly attaining an elevation of one hundred to two hundred feet, extending back on this plateau, to Bloomfield, the Oranges and Clinton townships. Its southern, southeastern and southwestern portion is situated on low meadow or flat lands, which are nearly on a level with the bay, and only about twelve feet above the ordinary tides, and during high tide it is partly covered with water. The length of the city is five and one-quarter miles; its width is four and three-quarters miles, and its area about eighteen square miles.

C.—WATER-SUPPLY.

Our water-supply is mainly from the Passaic river, a part from driven wells, and some from wells in various parts of the city, and is at times of an inferior quality.

That taken from the river and driven wells, is collected in reservoirs in different parts of the city, brought from the township of Belleville, through large iron pipes.

The admission of about two million gallons of water from the driven wells, into nearly ten million gallons used by the city daily from the reservoirs, has, in a measure, improved its quality, but there are times when its odor and taste are unpleasant; when chemicals and other substances, soluble and insoluble, are observed. Water, so important an element in our subsistance, when not pure, must necessarily prove deleterious to health and life, and unquestionably serves to increase the percentage of mortality.

D.—DRAINAGE AND SEWERAGE.

Underlying the more thickly populated, and to some extent, the less thickly settled portions, the city is extensively and fairly well drained by a system of sewers, which aggregate forty-eight miles, built of brick and pipe.

All improved streets, paved or unpaved, have stone gutters, which connect with sewer basins, and the water with that of the sewers, emptied into the river and bay, where the drainage soon becomes neutralized by the salt water of the tides. There are,

however, sections which are not thus favored, particularly the southwestern part of the city, where a creek receives the drainage of about twenty-five hundred acres of land, fifteen hundred of which are in the city of Newark, and one thousand in the township of Clinton. The drainage from Newark terminates by two main sewers, and is discharged into a ditch leading to Bound creek near, and west of the crossing of the Pennsylvania Railroad. This crossing has a culvert with a capacity inadequate to admit the free flow of the creek, when swollen with high tide and heavy falls of water; the drainage thus obstructed, causes a deposit of sewerage upon the low lands in the neighborhood, giving rise to bad odors, and must prove most injurious to the health of those residing in the vicinity.

This unfavorable condition has been presented to the attention of the Board of Health and the city authorities at several different times, who are now considering how best and speedily to remedy the evil, but up the present time, no definite action has been determined upon to secure this much needed relief. While our sewerage is fairly extensive, the sanitary requirements are increasing, and demand a more extended sewerage and more thorough drainage to decrease the list of mortality, which has been observed, especially in epidemics of scarlet fever and diphtheria. In some localities where sewers have not been laid, privy vaults and cesspools are defective in drainage, in consequence of rocky and clay bottoms. There are, in different parts of the city, vacant lots, which from their location and surroundings, are covered with stagnant water, producing complaint and disease, but the Board of Health are unceasing in their efforts to correct this condition, by draining, disinfecting and filling.

E.—STREETS AND PUBLIC GROUNDS.

The streets are generally laid out at right angles, broad, and to a large extent shaded by trees. The combined length of graded and paved streets is one hundred and seventy-seven miles—one hundred and thirty-one miles graded only, and forty-six miles paved with cobble stone, block stone, macadamized, Telford and wood. These wooden pavements, now condemned from sanitary considerations, and from want of durability and safety, are giving place to block stone.

PUBLIC GROUNDS.

The public grounds are enclosed parks, large and small. Three of them contain from three to five acres; four are much smaller. The larger parks are elegantly shaded, traversed by paved walks, lighted by gas, drained and furnished with seats. One only has a fountain of constantly flowing water.

F.—HOUSES AND THEIR TENANCY.

In the central portion of the city, included in the fire limits, the buildings are principally of stone and brick. Beyond this limit, they are of stone, brick, wood, &c., generally large, airy and commodious, and well ventilated, supplied with water from the reservoirs and many with drainage, which connects with the general drainage system of sewers, and others with cesspools. Most of the tenement houses are large, comfortable and cleanly, seldom, if ever, overcrowded. Some have modern arrangements for ventilation, but generally doors and windows are the only ventilators. No families live exclusively in cellars. Cleanliness of premises is either voluntary or compulsory.

G.—MODES OF LIGHTING.

Gas and kerosene are the common means of lighting. Electric lights are being introduced, and one of the public markets is wholly lighted by it; also one theatre and other buildings. All other public buildings and streets are lighted by gas. Two and a half million feet of gas is used for this purpose during the year.

H.—REFUSE AND EXCRETA.

Refuse which accumulates in the streets is carried out of the city or deposited in designated places within its limits, for filling low places, daily in nearly all, and two or three times a week in the more remote streets, in wagons for that purpose.

The streets are thoroughly and well cleaned at intervals, but the large surface of cobble-stone pavement, irregular and uneven in many places, requires more frequent attention than is given, for the securing of health and comfort. And there can be bu

little doubt, that from the want of more attention in this particular, the malaria of our locality is increased.

The refuse from butcher and meat shops, under constant inspection by intelligent officers, is never allowed to accumulate or become offensive, but is removed in wagons to be utilized. If there should be exceptions to the rule, it is so by criminal negligence of parties who create the refuse.

Excreta is removed from the city in covered tubs or casks or tight box-wagons, when required by individuals, or by order of the health officer upon complaint.

I.—MARKETS.

There are two public markets, which are well managed institutions, conspicuous for neatness, good order and system. They are large, convenient and scrupulously clean.

J.—DISEASES OF ANIMALS.

The diseases of animals have been through the year, of a mild and ordinary character, till within the month of September, and to this date, an epidemic influenza or epizooty of a contagious character has prevailed. Fortunately recovery is the rule.

Dead animals, whenever reported, are removed at once in closed ambulances, to be utilized, or by scavenger wagons with refuse.

K.—SLAUGHTER-HOUSES AND ABATTOIRS.

Slaughter-houses and abattoirs are under the constant observation and control of the meat and health inspectors, who compel cleanliness and inoffensiveness. There are two slaughter-houses within the city.

L.—MANUFACTORIES AND TRADES.

This city is essentially a great workshop, and is one of the most extensive manufacturing cities in the Union; it includes nearly every variety of trade known in any civilized country, with artisans and workmen from every nation. The structures are generally supplied with most modern and improved machinery, and arranged for the convenience, health and safety of their occupants. In a city so large, so wealthy and enterprising, all

trades must and have exhibited a most rapid growth, and commerce has assumed large proportions.

M.—SCHOOLS AND PUBLIC BUILDINGS.

Our schools are under the management of the Board of Education. The number of teachers in the employ of the Board is two hundred and seventy, of which twenty-six are males and two hundred and forty-four are females. The Board occupies twenty-eight buildings for actual class-room work. The enrollment in the day schools is eighteen thousand five hundred and twenty-three, and the evening, nine hundred and fifty-five; in the normal school, sixty; high school, four hundred and eighty-nine; grammar school, four thousand six hundred; primary schools, twelve thousand seven hundred and sixty; colored schools, two hundred and twenty, and industrial schools, three hundred and ninety-four. The work of teachers is earnest and successful. The school buildings are large, elegant and expensive, intelligently designed for healthfulness, safety of their inmates and convenience for pupils and teachers.

These, and all other public buildings, possess most of the modern improvements that the tests of time and experience have approved, for ventilating, heating, lighting, draining and other necessary sanitary arrangements, and under the constant vigilance of the Health Physician and officers of each of the departments and interested citizens, are becoming more schooled to the necessity of preventing diseases, and increasing the means for promoting health and comfort, safety and convenience.

N.—ALMS-HOUSES, HOSPITALS AND CHARITIES.

There are many charitable institutions in the city, one of which, the alms-house, is a large building, situated on the outskirts of the city, from which drainage is easy. It is commodious and under good sanitary arrangements and regulations. No epidemic diseases have occurred during the year. There have been twelve deaths of adult males, four females and six children. The alms-house sick are under the direct care of the alms-house physician. An eye and ear infirmary has been established during the year by enterprising benevolence, and is thus maintained. A corps of capable surgeons is in daily attendance in this in-

stitution, who receive and treat all applicants for services, free. Over three thousand patients have received treatment during the year. The city has no hospital, but contributes the sum of $5,625 (for beds) annually, in equal amounts to St. Michael's Hospital, (R. C.) which institution is under the care of the Sisters of the Poor; the Hospital of St. Barnabas, (Episcopalian) and the German Hospital. There is also an Alms-house Hospital, which is used as a pest-house, when circumstances require.

A dispensary is open daily with a corps of physicians in attendance upon those who are not able and not required to pay for medical services. Besides hospitals, dispensary and eye and ear infirmary, the benevolent institutions include The Female Charitable Society, Orphan Asylum, Foster Home, Home of the Friendless, Women's Christian Association or Home for Working Women, Boys' Lodging House and Children's Aid Society; nine temperance benevolent societies; Roman Catholic; Society for the Relief of the Poor, three Orphan Asylums, Hospital and Industrial School, Schools of Brothers and Sisters of Charity, Home for the Aged, House of the Good Shepherd for the wayward. Two police stations afford temporary relief to wayfarers, and during the past year has given lodgings to 20,432, of which number 19,775 were males and 657 females. Eight city physicians attend at their homes, all the sick and injured poor who apply to them.

BATHING HOUSES.

There are two bathing houses (public.) The bathers number this year 112,164 males, 16,608 females. Total, 147,762.

O.—POLICE AND PRISONS.

Eighty-two miles of streets are under police supervision. The police force at present is one hundred and fifty men, uniformed, drilled and disciplined, daily in attendance at each of the two police stations, day and night, under the direction of sergeants, captains and chief of police. In the station-houses are lodging rooms for policemen, wayfarers, offenders of the peace and prison cells for criminals, for both males and females. In these buildings are running water, wash basins and water-closets, as

well as other necessary conveniences, well appointed, duly inspected and fairly clean.

P.—FIRE GUARDS.

The Fire Department consists of a Chief Engineer, four Assistant Engineers, one Superintendent of Fire Alarm Telegraphers, and an acting force of one hundred and ninety-eight men, of which thirty-eight men are permanent; ten steam fire engines, ten hose carriages, two hook and ladder trucks, one supply wagon and one gig, thirty-nine strong and capable horses, a fire alarm circuit of sixty miles of wire, ninety-two fire alarm boxes, one thousand one hundred hydrants, and fifty-two public cisterns. At all fires is a salvage corps, maintained by the Insurance Underwriters' Association. The Fire Department will compare favorably with the best in this or any other country in organization, discipline, appliances, bravery and efficiency.

Q.—CEMETERIES AND BURIALS.

Within the city limits are three cemeteries and several burial grounds. The cemeteries are laid out and arranged with great care and expense, beautifully shaded, traversed with labyrinths of avenues and walks, ornamented with flowers and shrubs, and containing reception vaults; under the care of superintendents and keepers, and these under the control of the city health officers and common council.

There are also burial grounds which are in disuse, but well preserved and enclosed, and a city or public burial ground, (Potters field) where burials are free.

R.—PUBLIC HEALTH LAWS AND REGULATIONS.

The laws and regulations of public health here are necessarily extensive, an epitome of these may be obtained from the powers and duties of the Board of Health, and of officers who constitute that Board, whose meetings are held at such times and places as they may deem proper to provide for the protection and maintenance of the health of the city, by compelling cleanliness, preventing and abating and removal of nuisances, by sending non-residents with infectious diseases to the pest-house or hospital.

The removal of residents to the hospital upon recommendation, the removal of all or any residents to the pest-house who have infectious diseases, upon the written certificate of two physicians and of the Health physician, declaring the removal necessary for the preservation of the public health, the removal of disinfected goods when suspected of infection.

The purchase of medicines and remedies under the direction of the health physician, who also has control over the crews and passengers of vessels and crafts suspected of having infectious diseases on board, entering the city except by permission under penalty.

By causing to be displayed conspicuously upon houses where small-pox and other infectious diseases exist, signs, which shall not be removed without permission, under penalty.

The providing of suitable nurses for pest-houses, and by preventing any person from throwing offensive or unwholesome substances on the streets, ordering cesspools to be built and kept in order, sinks cleaned at night in an inoffensive manner.

Giving permission to clean sinks or privies by day, by certain processes, and by appointing sub-inspectors of health, and meat inspectors. These inspectors are under control of the health physician and Board of Health who hold their regular meetings monthly, and preceeding the meeting of common council.

S.—REGISTRATION AND VITAL STATISTICS.

Records are required from clergymen, of marriages, and from physicians of births and death, at stated intervals, to be sent to the City Clerk. The number of people in this city, according to the last census returns just made, is 137,163; of these 66,407 are males, and 70,756 are females; 96,841 are natives, 40,322 are foreigners; 133,874 are whites, 3,308 are colored (blacks and mulattoes); 10 are Chinese and 4 are Indians. The number of children between five and eighteen years of age is 41,935. The number of births during the year was 3,693. The number of deaths 2,S51, and the number of marriages, 1,225.

U.—SANITARY EXPENSES.

The appropriation for the present year to the Board of Health is $9,000.

V.—HEATING.

Nearly all the public buildings and many private dwellings are heated by steam, others by furnaces, but the greater number by stoves; the fuel is coal.

ITEM.

It will be observed that the list of mortality in this city, from October 1st, 1879, to October 1st, 1880, is 2,851 which number 200 includes still-born, and many from the three hospitals, county insane asylum, county jail and soldiers' home, who were non-residents. Deducting these, our rate of mortality which is now 20.8 per 1000, would be somewhat decreased. In presenting this first report of the City Board of Health to the State Board, we have endeavored to give a fair and just report, so far as observation and limited data could aid us.

We regret that the health physician, who has filled this position, ably and well, for many years, could not have given to your board, the result of his intelligent observations and experience, acquired from unceasing and untiring efforts, moral and physical, to enhance and improve our sanitary condition. His seriously impaired health has left the acting physician wholly dependent upon other resources, which necessarily render these papers less complete, and less perfect than a report from his hands.

Respectfully submitted,

C. M. ZEH,
Acting Health Physician.

ANNUAL REPORT

OF THE BOARD OF HEALTH OF THE CITY OF NEW BRUNSWICK.

BY H. R. BALDWIN, M. D.

NEW BRUNSWICK, N. J., October 1, 1880.

To the Honorable, the Common Council of the City of New Brunswick:

GENTLEMEN: The act entitled "an act concerning the protection of the public health and the record of vital facts and statistics relating thereto," makes it the duty of the Board of Health

of the City of New Brunswick to submit to your honorable body, on or about the first of October of each year, an annual report of the condition of the public health in our city, with other facts of interest in that connection.

The present Board of Health was organized under the provisions of the said act, on May 8, 1880. The gentlemen composing the Board, nominated by the Mayor and approved by Common Council, are Prof. D. T. Reiley, Mayor of the city, Drs. Henry R. Baldwin and Nicholas Williamson. *Ex-officio* members: Edward Tindell, Recorder of Vital Statistics, and Dr. Staats V. D. Clark, City Physician. The officers elected by the Board were D. T. Reiley, President; Edward Tindell, Secretary; S. V. D. Clark, Treasurer; Edward A. Reiley, Inspector.

Since the date of organization, stated meetings have been held weekly and semi-monthly, and considerable work has already been accomplished through the active agency of the Health Inspector, in regard to all forms of nuisance and matters deemed detrimental to public health. The Board was compelled to plan its work with some care. It was necessary, at first, to understand the general provisions of the act referred to, as well as of the new ordinance for the prevention and correction of nuisances, etc., approved September 16, 1879. Committees were appointed to hold conferences with the Commissioners of streets and sewers and the City Attorney, the object being to define the relative duties of the two Boards. By adopting this course, there has been no conflict of authority, but unity of action in the important work of guarding the public health. The members of the Board have cheerfully given their time and attention to a careful investigation of all matters of complaint, unpleasant as the nature of many of these complaints have been. This work, as your honorable body understands, is gratuitous, no member of the Board receiving any compensation whatever. As there was no apppropriation voted by the people to prosecute this work, although five hundred dollars was recommended for its accomplishment, it was necessary to ask your honorable body to make some provision for the pay of the Health Inspector, (an office created by the law, above referred to,) and a prompt compliance on your part with the request enabled the Board to go on with its work.

We do not deem it necessary to specify the various nuisances

that have been abated during the past summer. A record of all forms of inspection and complaint has been carefully preserved by the Inspector, and all important reports, papers, etc., have been filed by the Secretary for convenient reference. Whenever it has been necessary the Board has directed the application of legal force, under the direction of the city attorney. The complaints, fortunately, in but one or two instances, only being prosecuted under the provisions of the ordinance of September, 1879. In this connection we annex the number of inspections made, permits issued, and complaints investigated, from May 18 to September 30, 1880, inclusive, as follows:

Complaints	91
Inspections	278
Permits	237

Care has been exercised to conduct this work so as to avoid, as far as possible, unpleasant feelings between neighbors, and to exercise compulsory force only when absolutely necessary.

At a meeting of the Board held on May 24, the Health Inspector was instructed to inspect the First and Second Wards, with special reference to the condition of drains and the facilities for the escape of waste-water and sewage. A report was made showing the result of this inspection, which was approved by the Board. A committee was subsequently appointed to make a further examination of these water-courses, particularly what is known as "Fisher's Brook." An important paper on "Disinfectants, and How to Use Them," was also prepared by the Inspector and approved by the Board; also a paper on the "Condition of the Gutters of this City," by Dr. Clark.

The above reports or papers were furnished by the Secretary to the newspapers of the city for publication, and the proprietors of these journals, recognizing the importance of intelligent suggestions touching upon sanitary precautions or recommendations, cheerfully made room in their columns for these papers. These suggestions were thus brought to the homes of our people and made of practical benefit to them.

A record of vital statistics, as reported to the Secretary of State, by the City Clerk, for five months, or from April 15 to September 15, inclusive, we here annex, as follows:

Number of marriages, 52; number of births, 173; number of

deaths, all causes, 197; number of deaths of children, under five years, 96; number of still births, 19.

In reference to the general health it becomes our duty to report any serious deterioration thereof or hazard thereto; and in accordance with this enactment we beg to report as follows:

We are happy to say that there has been no more serious deterioration of the general health than has heretofore existed, save with two exceptions. The usual amount of infantile disease has existed, but not in malignant form. Still during the early summer the extreme heat was quite inimical to the lives of infants. Contagious and infectious diseases have also visited us, but not in such form as to be beyond control. One of the above exceptions has reference to the unusual prevalence of malarious diseases, which have been present in a degree unknown in this community during the last quarter of a century. Frequent cases of intermittent and some remittent fevers have called for the timely aid of the physicians. This seems to be largely due to the character of the last winter, and the absence of severe frosts, and somewhat also to the subsequent drought. The soil being saturated with vegetable matter in condition for decay, and the summer sun liberating the emanations, which have produced their characteristic effects. It may also be stated that the recent raising of the dam, at the site of the water-works, and the consequent flooding of new meadow land, may have so impregnated the drinking water with vegetable matter as to afford a suspicion that some of the intermittent may have arisen from this source.

The second instance of deterioration of the public health may be noticed as the prevalence of a number of cases of typhoid fever. As this is classed among the preventable diseases, it should exist only in the least possible degree; and whilst in the absence of positive statistics, it is unsafe to state positively the amount of typhoid prevailing in our midst; yet from inquiries directed to several physicians, whose practice covers a considerable portion of the town, it seems that we have more cases of this disease than belong to a city of good sanitary condition; but it is safe to assert that a general absence of the conditions of salubrity must exert a powerful influence in producing the disease, such as water taken from impure wells, bad sewage, and the foul condition of the gutters, which latter exists to an outra-

geous extent, and in the absence of legislation empowering the Board of Health to act promptly, must necessarily continue. Regarding any hazard to the public health, we are happy to say that an abundant supply of water, in general of wholesome character, (with the exception of the hint above given, and which is only temporary) has afforded a great protection; yet there are some portions of the town in which the water is drawn from wells, which are liable to all the deterioration arising from soakage of the soil with detrimental substances. We cannot pass by another large danger to the general health of the city, from our imperfect system of sewage which now exists, viz: the emptying of our sewers, as well as all the surface drainage of the streets into a slack water, (the Delaware and Raritan Canal). It will be readily seen that the deposit of animal and vegetable matter, the refuse of a large town, must contain elements most prejudicial to health. When, therefore, this basin is exposed to the sun as is occasionally the case, with its bottom covered with reeking filth and human excreta, can we conceive a more unwholesome state of affairs. It is not asserted that the germ or poison of typhoid is thus propagated, still there can be no doubt that the influence upon the general health is such as to favor the development of whatever specific causes of disease may either exist or arise.

SUGGESTIONS.

The Board of Health suggests the following amendments to the present ordinance:

To Sec. 3. And anything whatsoever that shall be deemed by the Board of Health prejudicial to the health of the community.

To Sec. 9. That no animals be buried within the city limits without the permit of the Board of Health.

To Sec. 10. That the Board of Health at any time may require the owner of any cesspool and privy-vault to cement it in such a manner as to make it water-tight, and that all cesspools and privy-vaults hereafter constructed to be under the same authority.

To Sec. 18. The carrying on of all occupations should be under the control of the Board of Health so far as they may judge *them* to be nuisances or injurious to health, and permits *must be* obtained from the Board of Health for carrying on *such business.*

The right of the Board of Health, or their officers, to enter premises, has been omitted from the new ordinances and should be inserted.

Persons should be required to use disinfectants upon their premises according to the judgment of the Board of Health. Quicker action should be possible than a three days' notice, as in case of an epidemic or a recently created nuisance. The Board of Health should have the fullest power to vacate, disinfect and cleanse premises, or cause them to be so vacated, cleansed and disinfected.

Houses occupied by two or more families (tenement houses) to be furnished by the owners with proper means for carrying away waste-water, slops, etc., to be constructed in accordance with the directions of the Board of Health.

Whenever sewers exist, the Board of Health should have the power when they deem necessary of compelling connections to be made therewith.

The following points can only be reached by application to the Legislature:

1st. Greater power and clearer procedure of the Board of Health when nuisances are within the domain of the commissioners of streets and sewers.

2d. Physicians should be obliged by law to furnish reports periodically of contagious and infectious diseases to the Board of Health.

Respectfully submitted,
D. T. Reiley,
Henry R. Baldwin,
Edward Tindell,
Committee.

Attest: Edward Tindell, Secretary.

Accepted and ordered filed by Common Council, October 4, 1880.

Edward Tindell, City Clerk.

ATLANTIC COUNTY.

ABSECON. - - *Report from* E. H. MADDEN, *Absecon.*

ATLANTIC CITY. *Report from* THOMAS MCGUIRE, *Atlantic City.*

C.—The water-supply at present is from cisterns. The carelessness of many of the old inhabitants in not attending to their cisterns properly is the cause, no doubt, of some sickness. Others not having cisterns, use the surface water, and, I think, in the fall of the year this causes malaria. I am in hopes before another year we shall draw our supply of water from the mainland or artesian wells.

V.—One of the most important functions of the Board is that concerned in the investigation and suppression of nuisances. There are a number of cases reported, and some are so complicated that they involve careful and patient investigation and assiduous care in their management. A great deal of unnecessary, as well as unpleasant labor, is forced upon the Board by the refusal of persons, after proper notification, to abate nuisances for which they were responsible, thereby obliging the Board, in furtherance of the public weal, to authorize the work to be done, and institute proceedings at law for the recovery of the expense. We feel that there is a straight line of duty to pursue, and as far as we know the right, we mean to pursue it.

The importance of a sewer system based upon a regular established grade is insisted on. This illustrates how important it is that every city should have a complete sanitary sewerage and map as preliminary to all drainage, sewerage, or grading plans.

BUENA VISTA, - - *Report from* JOHN FAUX, *Vineland.*

EGG HARBOR TP., - - *Report from* L. CONOVER, *Absecon.*

The only prevalent disease reported is that of chicken cholera. It may be said here that under the head of diseases of animals, many of the reports from various sections of the State allude to the disease and the serious loss to farmers thereby. A new

interest attaches to it from the fact that Touissant and Pasteur seem recently to have shown that the disease is owing to an oval-shaped micro-organism. Pasteur has taken this and cultivated it in other media, such as decoction of muscle. The germs from a decided case are made to multiply in a muscle-decoction or culture fluid. If this fluid is used at once it produces a severe form of the disease. But if allowed to stand for months and then used, it produces a very mild form of the disease, which protects the fowl from another attack, just as vaccination protects from small-pox. Pasteur is believed by many to have discovered a method not only of preventing the virulence of fowl cholera, but also that of hog cholera, pleuro-pneumonia, and many other diseases of animals. The subject is of the greatest interest, not only pecuniarily, but in its bearing on human diseases.

GALLOWAY TP., - *Report from* GEORGE W. ALLEN, *Oceanville.*

The report notices pulmonary diseases as affected or produced by the heavy sea air.

HAMILTON TP. *Report by* D. B. INGERSOLL, M. D., *May's Landing.*

The report presents answers to all the schedules, and is emphatic upon the increasing evils arising from the use of tobacco as an "injury to the health of community and especially to the youth and children of our land." The increase of this use by those young in years is certainly a subject worthy of the attention of our citizens Some cases of typhoid-malarial fever, a disease unusual in that section, are noticed.

HAMMONTON TP. - *Report by* M. L. JACKSON, *Hammonton.*

MULLICA TP. - - *Report by* W. S. MILLER, *Pleasant Mills.*

The report properly protests against the careless deposit of the garbage of Atlantic City, brought to it, under contract, on cars, which themselves become offensive and hazardous to the public health. This township was one of those in which, at first, a Board of Health was felt to be unnecessary, but soon had an

illustration of how important it is to have some health authority in every district.

WEYMOUTH TP. - *Report from* ANTHONY J. PARKER, *Tuckahoe.*

BERGEN COUNTY.

LODI TP. - *Report from* JOHN VANBASSUM, *Coroner.*

MIDLAND TP. - *Report from* JOHN G. ZABRISRIE, *Areola.*

The report notices nothing unusual, save the uncommon prevalence of malaria.

NEW BARBADOES TP. *Report from* H. H. ZABRISKIE, *Hackensack.*

The prevalence of malaria is noticed. We quote from the close of the report as follows:

"The operations of our Health Board since its existence, have been satisfactory in good results, by awakening the attention of our people to the existence of unsanitary conditions in their midst; many of which have been radically changed.

"If our Legislature will make more definite the manner of prosecution for delinquencies in regard to sanitary observances together with a much needed provision for the appropriation of pecuniary means by the township committee, for securing needed reforms, we have before us, through the increasing sanitary knowledge of our population, the prospect of good work soon to be reported, for the whole field of our supervision."

PALISADE. - *Report from* PETER BENDER, *Schraalenburgh.*

The report refers to malaria as common, although not so severe as the previous summer. Bronchial and lung troubles also seem on the increase, as is generally the case where there is imperfect drainage and accumulations of vegetable matter.

RIDGEWOOD, - - *Report from* I. A. MARINUS, *Ridgewood.*

SADDLE RIVER, - - *Report from* W. H. GILL, *Ridgewood.*

UNION, - - - *Report from* G. R. ALYEA, *Rutherford.*

BURLINGTON COUNTY.

BEVERLY CITY, - *Report from* ELIAS LONGSTREET, *Beverly.*

The Board has inspected the cellars, wells, privies and drains of a large part of the town, and requested citizens to report all nuisances on public or private grounds.

BORDENTOWN TP., *Report from* LUCIEN HUNT, *Bordentown.*

BORDENTOWN CITY, *Report from* DANIEL G. WALKER, *Bordentown.*

The town is defective in its drainage and sewerage.

BURLINGTON CITY.

The report shows a well organized Board, but owing to the lateness of its organization, full items could not be furnished.

CHESTER TP., - - *Report from* I. C. STROUD, M. D.

There has been intermittent fever of an unusually severe type. A fever would set in and last for forty hours, and the patient would be very delirious * * We have a low, flat stream of water, very sluggish in its motion, and an abundance of weeds and grass all along the stream for seven or eight miles, to which has been attributed the great amount of fevers in our neighborhood.

CHESTERFIELD TP., - *Report from* CHAS. D. LIPPINCOTT, *Crosswicks.*

CINNAMINSON TP., - *Report from* I. D. JARNEY, M. D., *Cinnaminson.*

EASTAMPTON TP., - *Report from* WM. G. LIPPINCOTT, *Mt. Holly.*

Some malaria this year, and a severe type of diphtheria.

LITTLE EGG HARBOR, - *Report from* T. T. PRICE, M. D., *Tuckerton.*

The report speaks of the uniform health of the township: "Its mild, marine climate renders it a favorable abode for consumptives. We have no malaria."

LUMBERTON, - - *Report from* ISAAC FENMORE, *Lumberton.*

MANSFIELD, - - *Report from* AMOS BLAKE, *Columbus.*

NEW HANOVER, - *Report from* GEORGE C. DAVIS, *Wrightstown.*

"There is no system of drainage or sewerage other than by natural means, or what may be built and used by private parties as they may individually think necessary, refuse and excreta being disposed of as is customary among farmers. I would here just mention to the Board the great neglect of farmers owning marshy and low lands, in not draining them. Almost every farm in the township has several acres of that kind of land, which could be converted into good land for pasturage, worth more, acre for acre, than any on their farm, besides making their plantations more healthy. In fact, I believe these low, marshy places, running up, as they do in many instances, back of the dwellings of those that live in them, are the cause of so many diseases. The water becomes stagnant and polluted with all the foul gases of the air, therefore creating the very germ for malaria, &c. I would here call the attention of your honorable Board to the necessity of having a uniform system of drainage throughout the State, both for the interest of the farmer and the welfare of humanity in general. I would here suggest to your honorable Board that it appeal to the Legislature, at its coming

session, to make a provision in some way to encourage a system of thorough drainage throughout the State."

"Some of our school-houses are badly ventilated, being built in olden times, when people built school-houses to correspond with their out-buildings on the farm, not caring for the health and comfort of their children any more than they did for their swine, crowding their children together in low, cramped-up buildings, inhaling the same air over and over again, until sickness came upon them, to be taken home to be physiced up, to go through the same process again."

NORTHAMPTON, *Report from* F. ASHURST, M. D., *Mount Holly.*

PEMBERTON, - *Report from* WM. P. MELCHER, *Pemberton.*

There are no other public buildings except the Burlington County Poor-house, situated two and a half miles east of the borough of Pemberton. This institution was founded in the year 1800. The farm comprises six hundred acres, of which four hundred and thirty is tillable land, the balance brush and woodland. The institution comfortably accommodates three hundred and twenty-five inmates. The number at present is two hundred and seventy, females being slightly in the majority. Number colored, forty. In the insane department there are: males, twenty-three; females, forty-five. Number discharged, improved, during the last six years was twenty-nine; males eight, females, twenty-one. Of this number (29) eleven (two males and nine females) came from the State asylum. Average number of inmates for year ending May 12th, 1880, three hundred and fifteen; number of deaths, twenty-seven; births, seventeen.

RANDOLPH TP., - *Report from* CHAS. T. ALLEN, *Lower Bank.*

SOUTHAMPTON TP,, - *Report from* J. H. BROWN, *Vincentown.*

The only thing that we are bothered with as a prevailing disease is the ague.

WASHINGTON TP., *Report from* CHAS P. NICHOLS, *Green Bank.*

CAMDEN COUNTY.

CAMDEN, - *Report from* ALEX. J. MILLIETTE, *Camden.*

CENTRE TP. - - - - EZRA C. BELL, *Mt. Ephraim.*

There have been some cases of malarial fever this year.

DELAWARE TP. - - - ABEL HILLMAN, *Haddonfield.*

The prompt action of this Board, in reference to a case of small-pox which occurred in a laborers' boarding house, no doubt prevented the extension of the disease.

GLOUCESTER CITY. - - ALFRED HILLMAN, *Haddonfield.*

This Board has issued every precaution they thought necessary, looking to the city's welfare. Communications from the City Physician, with reference to nuisances and of parties having them, having been received, their places have been visited by the Board and the evil abated. There were one thousand (1,000) circulars printed and distributed throughout the city, calling the attention of citizens to the uncleanliness of yards and other places.

The Camden county Alms-house contains one hundred and fifty-five patients, and a new hospital has been erected during 1879, having a capacity for forty beds, and will probably be opened for the reception of indigent patients during the year. On the same county premises, there has recently been built an asylum for the insane, with accommodation for seventy-five patients. Present number, fifty-eight.

The Board made a careful inspection of these two institutions, and found the sanitary condition good, except the ventilation and sewerage of alms-house, which are sadly defective. The asylum was found perfect in every respect, except a proper ventilation of water-closets, these being inefficient to convey off the various odors emanating from them. The local Board of

Health respectfully refer the same to State Board of Health for their investigation.

The general health of these two institutions has been impaired by the prevalence of malarial fevers, which are endemic to the locality, and cannot be prevented only by large expenditure or removal of the buildings from their present sites, which are located on the south side of a drained meadow, receiving all the decayed vegetable matters for several miles up the stream. Their drinking water is obtained from a pond covered, during the warm season, with algae, and when carried to the respective buildings contains the deposit to a visible extent. No epidemic diseases have prevailed and the inmates have been thoroughly vaccinated. All our school trustees have, within the knowledge of the Board, complied with the requirement of the law in having all the children in the respective districts vaccinated.

As a supplement to this report, permit us to refer briefly to a circumstance by which a timely precaution and investigation has averted an outbreak of typhoid or typho-malarial fever. At the County Insane Asylum a well was dug in July, eighteen feet deep, outside of main building but inside of a rear annex, in close proximity to a main sewer pipe; the water, after a few days, became intolerably offensive to taste and smell, so that it was advised by the attending physician to abandon it and close it securely. Various theories originated in reference to the impaired quality of water from this well; some attributed its offensiveness due to organic matter from the old pauper graveyard, upon which the building was erected in 1879, others to a leakage in the main sewer pipe, which had either accidentally been struck in digging the well, or from fracture of pipe, caused by settling of foundation walls of the building. The latter supposition we regard as most probable, and a careful analysis of the water, made by an expert chemist, reveals its constituents as phosphates, sulphrates, and a large per cent. of organic matter.

The officers of institution propose having sewer pipe carefully examined. Signed

R. B. STEVENSON, *Chairman.*
E. J. COLES, *Secretary.*
J. W. MCCOLLOUGH, M. D.,
Township Physician.

Dr. McCullough also furnishes the following account of a number of severe cases of sickness that occurred in Gloucester and Centre townships.

BLACKWOODTOWN, N. J., September 29, 1880.

DEAR SIR: Excuse delay in complying with your request, in contributing to you the desired information in reference to a sickness which prevailed in this locality. The cases occurred in the townships of Centre and Gloucester, which are situated five to ten miles southeast of Camden city, bounded west by Timber creek, (a tide-water creek,) flowing into the Delaware. The inclosed map, hastily drawn, for your better understanding of the situation, will also give you a correct idea of the geographical limits of the fever.

I have a record of thirteen cases, personally treated, and as many more occurring in the same locality, and treated by my colleague, Dr. H. E. Brannin, also Doctors Shivers and Quint; total, thirty cases. The first cases occurred about the first of August, 1879, and obtained the greatest prevalence in September, with a few cases in October, and all ceased in November. The area of county infected was two miles in extent, and as near as I am able to estimate, one person in six and two-thirds of population contracted the fever, and the death rate was nearly nineteen per cent. The deaths in my practice, from the so-called typho-malarial fever, were two, and total six in the practice of all the attending physicians.

The incipient stage was marked with the usual premonitory symptoms of languor, mental depression, feeling of coldness down the back and persistent headache, with succeeding febrile symptoms, furred tongue, frequent pulse, epigastric tenderness, and urine scanty and high colored; the diurnal remissions occurring in the morning, and exacerbations taking place towards evening. This condition remained for an indefinite period, until the remission became less noticeable and until the thermometer failed to detect any but a steady and unvaried course of fever of a typhoid character. The principle features were a pulse varying from one hundred and twenty to one hundred and fifty, temperature one hundred and two to one hundred and four, dry, red, and brown tongue, generally a bronchial complication, tympanitis, and often profuse diarrhœa, slightly hemor-

rhagic, delirium relapsing into stupor, and the cases terminated before twenty-first day, in death or a tedious convalescence. The treatment pursued was the alkaloids of cinchona, first, and alteratives, and after assuming the typhoid character we abandoned quinia and substituted the acids with stimulants, beef tea, milk, &c., with turpentine and bromidis and opium, to meet local indications. These cases occurred in a malarial locality, along the east side of Timber creek, where intermittents every year prevailed and afflicted the old residents all their lives.

It was the frequent observation of watermen, who followed the creeks, and the residents, in close proximity to the same stream, that the tides were lower last season than any previous period in their recollection, which would account for the greater prevalence of malaria; but this theory is not well sustained, and, in my opinion, there was less intermittent in 1879 than in the present year 1880.

To properly and effectually solve the real origin of the typhoid element, which was one of the conspicuous features, we must search for the principal cause, viz: The use of material which had been hauled from Philadelphia, and extensively employed by farmers and truckers on their lands, and from deposits on the various landings on the creek. These fertilizing manures were ill-smelling and offensive at considerable distances, and consisted of street dirt, blood from abattoirs, and soap fat, &c., from Philadelphia. The majority of cases occurred in the vicinity of a putrid heap of manure, and all fatal cases, with one exception were in the same locality as the manure pile.

A farmer who dealt extensively in this latter material lost a son, and his two daughters were simultaneously seized and prostrated with the same fever, recovering, finally, after a tedious convalescence. Another farmer, his nearest neighbor, quarter of a mile distant, was stricken, afterwards a daughter, both of whom died. Directly across the road, a young married lady was prostrated and died; many others, at close distances from the first outbreak, were taken. It has been suggested that impure water might have been found at the door of these families, and the water might have developed, by analysis, some organic matter, as hog pens and barn yards were sufficiently near three places, where the fever occurred, to give a semblance of truth to this

theory; but these families had been drinking water from the same wells for many years and the water was apparently healthy in quality. I cannot share in the opinion that this was the chief cause. There have been no cases of fever of a typhoid grade in this locality the present season. The inhabitants are drinking the same water and throw their deposits of house on the soil near the house. No more of these offensive manures have been used in the neighborhood since 1879, and since we have had no outbreak of fevers.

HADDON TP., - - - J. STOKES COLES, *Haddonfield.*

STOCKTON TP., - PHILIP W. BEALE, M. D., *Cramer's Hill.*

Three cases of small-pox which occurred were promptly attended to, and houses fumigated and vaccination performed. There was no further spread.

CAPE MAY COUNTY.

CAPE MAY CITY, - - ELDRIDGE JOHNSON, *Cape May.*

The Board has several times abated nuisances. The following is a part of their ordinance and their form of notice:

SEC. 2. *And be it further ordained and enacted,* That the Board of Health shall have power, and it shall be their duty, to make and by order direct to be made, through the Mayor, by the Marshal or any police officer, diligent inquiry with respect to all nuisances, of every description, which are or may be injurious to the public health, and to abate the same in any way or manner they may deem expedient. Second—to stop, detain, examine, and by order to direct to be stopped, detained and examined for the purpose of preventing the entrance of any pestilence or contagious or infectious disease in the city, any person coming from any place infected or believed to be infected with such disease, and to prevent such person from coming into the city. Third—to remove from the city or cause to be disinfected or destroyed any furniture, wearing apparel, goods, wares, merchandise, diseased animals or other property of any kind landed by railroad or

steamboat or other conveyances, or stored in the city, which shall be suspected of being or sworn to be tainted or infected with pestilence, or which shall be likely to pass into such state as to generate or propagate disease.

SEC. 3. *And be it further ordained and enacted*, That every person who shall be served with a copy of any order made by the Board of Health, under the powers conferred by this ordinance, and shall neglect or refuse to obey, or comply with the same, shall forfeit and pay, upon due proof before the Mayor or Alderman, a fine of twenty dollars for every offence, and stand committed until fine and costs are paid.

LOWER TOWNSHIP, - - CALEB WOOLSTON, *Fishing Creek.*

CAPE MAY POINT, - - D. C. GODFREY, *Cape May Point.*

CUMBERLAND COUNTY.

BRIDGETON, - - - DANIEL B. GINENBACK, *Bridgeton.*

The report furnishes particulars, valuable for future reference, as do many others from which no special extracts are made.

DEERFIELD, - - - - JOHN W. AVIS, *Deerfield.*

HOPEWELL, - - - CHAS. H. DARE, M. D., *Shiloh.*

LANDIS, - - - - - - - WILLIAM ROBERTS.

A full report of all details as to the township.

MAURICE RIVER, - - - ISAIAH LORD, *Heislerville.*

STOE CREEK, - - - EPHRAIM MULFORD, *Roadstown.*

Millville and Downe report Boards of Health.

ESSEX COUNTY.

BELLEVILLE, - - - D. M. SKINNER, M. D., *Belleville.*

The report notices improvements being made in the condition of streets and in drainage; the good arrangement for preserving life and property in case of fire, and the need of improvement in one of the school buildings.

BLOOMFIELD, - - - JOSEPH K. OAKES, *Bloomfield.*

U.—We have spent sixty dollars the last six months, the most of which was expended in ditching a piece of ground (about six acres) near the centre of the town. The sewerage from neighboring houses was deposited on it. By making this ditch, we get rid of this sewerage in a great measure, and have made the land through which it passes comparatively dry. We think it will be the means of increasing the health of that part of the town. We expended ten dollars in another part of the town, to cut a ditch so as to drain a stagnant pool of water. The Board has had a number of complaints on account of nuisances. The Secretary has written notices to those persons complained of, who have, in most instances abated the same. We would suggest that the Board of Health have power to appropriate money for sanitary purposes. It might be limited not to exceed a certain sum, say one hundred or two hundred dollars for one year.

W.—Complaint was made to the Board early in the season, of the condition of the water in Toney's brook. The Board investigated the matter, and came to the conclusion that the impurities of the water were caused mostly by factories in Mt. Clair township. On the stream, in Mt. Clair, there are two factories; the upper one, where they make and print labels for all kinds of goods, the refuse coloring matter they throw in the stream. The lower factory in Mt. Clair, is a straw-board factory; in preparing the straw and reeds, (from the salt meadow) they use alkalies and acids, and a considerable portion of the refuse gets into the stream. Also, over the stream, in Mt. Clair, there is quite a number of privies. The consequence is, when the water gets in the next pond below, which is in Belford, it is pretty well satu-

rated with impurities. There are three ponds in a circumference of half a mile in Bedford. When these ponds are low, in warm weather, it takes some time for them to fill up; in the meantime, the sun acting on this mass of polluted water, causes a smell or gas, which is injurious to the health of the place. We wrote to the Montclair Board of Health, to ask them to co-operate with us in the abatement of the nuisance. They appointed a committee of their Board, (Dr. Pinkam was chairman) who examined and analyzed the water in the ponds of Montclair and Bloomfield. In their report, they state that the water in the Bloomfield ponds is far more impure than the water of the Montclair ponds (the water is so bad that there is no living fish or snake in it). The committee also recommended the factory owners to keep their refuse matter out of the stream. Do not think this has been done to any extent. The question arises, what can be done to abate this nuisance? We should be pleased to have the counsel of the State Board of Health, so that next summer we may be prepared to take some measures to abate this evil.

CALDWELL, - - - - C. M. HARRISON, *Caldwell.*

During the past year several cases of malarial fevers occurred on the line of a small stream flowing through the village of Caldwell. It was noticed that the waters on a small pond nearly in the center of the village were coated over with a peculiar growth of algæ. Mr. H. H. Rusby, a botanical expert, made an examination of this algæ under a magnifying power of four hundred diameters. He found nine species.

The existence of this algæ I took as being evidence of something more than a condition of stagnant water; for they had not been observed before. Of course no evil could result directly from these growths *per se*, but the contamination of the water proved that an evil was to be remedied. An examination of the stream above, showed that at one or two points, privies were located nearer the brook than they should have been, and that the overflow from cesspools on the grounds of the penitentiary, reached and poisoned the waters of the brook. At points in the stream, where the flow was very slug-

gish, the water was found to be swarming with animalculæ. The wastage from the cooking and washing rooms of the penitentiary for the past two years, has in unreasonable quantities, escaped into this brook, and no doubt the cases of malarial fever referred to can be directly traced to this source. Parties were notified, but the evils complained of have been mitigated only—not removed.

During the heated term in August of the present year, two cases of typhoid and several of malarial fever occurred at Newark City Home. This institution is beautifully located on a shelving portion of the eastern slope of the Second Mountain. The institution belongs to the city of Newark, and our local Board here refers to the matter only because the facts developed are pertinent to such a report as this. The examination was made by our secretary who was recently appointed to take charge of this institution. He found the plumbing exceedingly defective, and that portions of the building were infected with sewerage gases. The traps of the pipes were no where ventilated, and in some cases the pipes themselves were filled with noxious matter and unserviceable. Alderman Chas. Marsh, of the Trustees, took the matter in hand in an energetic and business like manner, changed the system of drainage throughout, and provided proper ventilators. The sanitary condition of the building is now, in most respects, excellent. It is worthy of note in this connection that the most malignant case of fever was developed in a young lad of fifteen years, whose bed was next adjoining a most defective water-closet. These facts are worthy of attention, because their study enforces truths which must be regarded in the construction of public dwellings.

The healthfulness of the township has been unusually good for the year past. The farmers have had no contagious diseases among their cattle or other stock. The so-called epizootic during the fall months, was of the lightest type, and produced no disarrangements among the teamsters. Chicken-cholera has raged here and there, involving small losses, but, beyond this, we have nothing other to report.

With ample facilities for thorough drainage, Caldwell may place herself in an enviable position so far as a clean, pure and dry local atmosphere is concerned. Herein we have the first condition of general healthfulness.

CLINTON TOWNSHIP, - - D. S. SMITH, M. D., *Irvington.*

A communication from citizens, was made stating their grievances, arising from the sewerage deposits upon the meadow lands of the township, by the city of Newark, it being, in their opinion, health-destroying, through exhalations from such noxious materials, and praying this Sanitary Board to take cognizance of, and if possible, deliverance from the same. The communication was accepted, ordered on file, and a copy to be sent in the report to the State Board of Health.

At a meeting of the citizens residing in the southeastern portion of the township, holden this day, October 9th, 1880, at the house of Caleb Earl, for the purpose of deliberating upon the deleterious effects of the sewerage deposits upon the meadow land, by the city of Newark, and consulting together as to the propriety of taking action thereon, Mr. Henry Meeker was appointed chairman, and Dr. Isaac M. Wood, secretary of the meeting. After a full and free expression of opinion as to the health-destroying exhalations from such noxious materials, attested by the production of miasmatic disease through the neighborhood, as well as blasting (by the nauseating affluvia engendered) the character of this section of the township, so hindering its material prosperity, it was unanimously

Resolved, That the Chairman and Secretary be instructed to present in our behalf, our grievances to the Sanitary Board of the township, praying them to take cognizance of the same; and in if their wisdom, deliverance from it be possible, to interpose, in our behalf. With the request that our Secretary present this our appeal to the Sanitary Board, at their first meeting, duly signed by the officers of this meeting, the same was adjourned.

Several Freeholders appeared and presented complaints against three parties for receiving foul or noxious materials, and allowing the same to be deposited upon their lands. The Clerk of the Board was directed to serve notices upon the several parties (excepting the sewerage nuisance of Newark) demanding removal and discontinuance of the same.

LIVINGSTON TP., - - - - S. H. BURNET, *Livingston.*

MILLBURN, - - - - - A. J. R. SIMPSON, *Millburn.*

NEWARK, - - - - C. M. ZEH, M. D., *Newark.*

Report already given.

SOUTH ORANGE, - - A. M. RANSOM, M. D., *South Orange.*

The report notices the very low death rate.

WEST ORANGE, - T. MEREDITH MAXWELL, M. D., *Orange.*

GLOUCESTER COUNTY.

CLAYTON TP., - - - - T. S. TURNER, *Clayton.*

FRANKLIN TP., - - - - J. C. RICHMAN, *Malaga.*

The report notices the necessity of guarding against the illegal practice of unskilled or unprincipled practitioners.

GREENWICH TP., - - - JOHN STETSON, *Paulsboro.*

GLASSBORO, - - - - JOHN E. PIERCE, *Glassboro.*

The report refers to the successful action of the Board in correcting a slaughter house nuisance. Some cases of pleuro pneumonia occurred in this township. The intelligence of Local Boards, as to it, can be a great aid in its suppression.

MANTUA, - - - - B. A. CORSON, *Mantua.*

Four cases of small-pox occurred in the township, but all recovered. Prompt attention prevented the spread of the disease.

WEST DEPTFORD TP., - JAMES T. BUDD, *Woodbury.*

WOODBURY CITY, - - R. S. CLYMER, *Woodbury.*

A plan and survey of the whole city is about completed and a system of drainage and sewerage is to be adopted.

WOOLWICH TP., - - SAMUEL AVIS, *Swedesboro.*

HUDSON COUNTY.

This county, on account of its dense population, has a County Board. We are indebted to it for obtaining local reports and for securing a filling out of schedules. We this year only give the names of the corresponding officers.

HUDSON COUNTY, *Clerk of Board*, E. J. ROONEY, *Jersey City.*

BAYONNE, - - - H. MORTIMER BRUSH, M. D.

HARRISON.

A committee of Council is the Health Board.

HOBOKEN.

JERSEY CITY.

Board of Police Commission is Health Board.

KEARNY, - - S. W. CLASON, Chairman, *Arlington.*

NORTH BERGEN, - - A. ENGELBRECHT, *Homestead.*

TOWN OF UNION, - FRED C. HANSEN, Clerk, *Town of Union.*

UNION TP., - - - - WM. H. SCHMIDT.

WEST HOBOKEN, WM. G. SMITH, Health Insp'r, *West Hoboken.*

WEEHAWKEN TP., - - F. W. SHEERWOOD, *Hoboken.*

HUNTERDON COUNTY.

EAST AMWELL, - - B. C. YOUNG, M. D., *Ringoes.*

The report notices prevalent health, except some malarial disease, which is not usual.

FRANKLIN, - - CHAS. M. TRIMMER, *Quakertown.*

HIGH BRIDGE, - - JAMES H. WALKER, *High Bridge.*

Since its organization the Board has carefully looked after the health conditions of the township.

HOLLAND, - - - DR. J. T. RIBBLE, *Milford.*

The report notices the malarial fevers of an unusually severe type have been generally prevalent along the Delaware, the whole length of the river border. Our reports show that this has been true along nearly the whole course of this river—more we believe, than in any previous year. We believe it not very difficult to find what causes have been in operation to impede its waters, to effect adjacent drainage and to accumulate vegetable matter preparatory to dry hot seasons and unusual alternations of water covering.

KINGWOOD, - - WM. R. READING, M. D., *Baptisttown.*

LAMBERTVILLE, - - - - GEO. H. LARISON, M. D.

The Report deplores the neglect of vaccination and presents the need of more authority for health boards.

LEBANON TP., - - - - W. V. PRALL, *Changewater.*

In one of our towns there have been several cases of malarial and typhoid fever this summer. The supposition is that the

cause of it was that the cisterns on which railroad laborers and others depend do not get cleaned as they should be.

RARITAN TP., - - - DAVID DUNHAM, *Flemington.*

READINGTON, - - - - - JOHN V. BERKAW, *Stanton.*

TEWKSBURY, - - - M. L. McCREA, *New Germantown.*

TOWN OF CLINTON, - - - S. VAN SYCKLE, *Clinton.*

UNION TP., - - - - W. STOCKTON, *Pattenburgh.*

WEST AMWELL, - - JOHN T. DRAKE, *Lambertville.*

MERCER COUNTY.

CHAMBERSBURG, - - - EDW. B. SKELLINGER, *Clerk.*

The majority of property-owners have a pit dug in the yard adjacent to their houses, over which (pit) a water-closet or out-house is placed. Pipes leading from the house carry all the refuse water from this source into the pit, and it often happens that the plumbing is so defective, or of such a cheap character, that the stench arising from the contents of the pit will find its way through the pipe back, and contaminate every cubic foot of atmosphere breathed by the inmates of such house. Malarial fevers are quite common this fall, as well as during the past summer, and as a practitioner of medicine it has fallen to my lot to see several cases of the most malignant type, the exciting cause of which I attributed, (in a large degree,) to defective drainage.

The sanitary expenses of this borough are wonderfully small, the appropriation ($30) this year being the largest sum ever devoted to that branch of public service.

EAST WINDSOR, - - - A. A. WRIGHT, *Hightstown.*

The population outside of Hightstown is 1000.

HIGHTSTOWN BOROUGH IN EAST WINDSOR TP., - -
W. W. SWETT, *Hightstown.*

Malarial fevers have prevailed to an extraordinary extent, the locality having been for many years entirely free from anything of the sort.

The pond lying to the east of the north portion of the borough is generally run quite low during the summer season, and is well supplied with the Yellow Pond Lily and much decayed vegetable matter. The sewage from the Peddie Institute added to this ought at least to deter people from using ice from this pond.

EWING TP., - - - - WM. H. COOLEY, *Trenton.*

At a subsequent meeting of the Board a petition was handed us to abate a nuisance known as Keeler's Mill Pond, said mill pond said to be the direct cause of a great deal of malaria. Twenty-three (23) families out of twenty-five (25) have suffered more or less all summer, all these families living on or near to this pond. The Board have taken the matter in hand, and have tried two or three means to have it removed, but have not yet succeeded. The fact of this disease being so prevalent all over the country has worked very much against us.

This township has also an effective sanitary association which is a good model for other towns and townships.

HAMILTON TP., - - JOSEPH H. WEST, *Hamilton Square.*

HOPEWELL TP., - - JOHN FLEMING, *Pennington.*

About the only epidemic that has prevailed since the Board has organized, has been malaria, which has been very bad, especially in the western part of the township along the Delaware.

LAWRENCE, - - JOHN P. SCUDDER, *Lawrenceville.*

PRINCETON BOROUGH, - WM. A. DURYEE, *Princeton.*

Our Board was chosen in early summer. It was scattered during our vacation period. A portion of the members, after a few weeks, declined to serve, and it is only within a few days (October 25,) that all the above members consented to serve. Still some good has been accomplished. Locations that need care are known; wells have been examined; some nuisances abated, and otherwise the Board now hopes to begin to do good work. The borough is districted, and committees appointed. It may be expected that we would include the college in this report, but so much has already been written—much true and much false—and the circumstances of the college sickness are so fully known to the officers of the State Board, that nothing further is said at present.

TRENTON, - J. D. WOOLVERTON, M. D., *President of Board.*

WASHINGTON TP., - JOSEPH HUTCHINSON, *Robbinsville.*

WEST WINDSOR, - JOSEPH H. GROVER, *Princeton Junction.*

There has been more malaria than usual. In this, and in very many of reports, the epizootic among horses is noticed. It is of interest, as showing how wide spread such an epidemic may be, and how independent of local influence in the fact of its existence. Also, as we compare it in severity with that of 1872-3, and compare climatic conditions, there is reason to believe that its mildness had much to do with weather conditions. There are some allusions to the fact that a mild influenza was at the same time prevalent among human kind.

MIDDLESEX COUNTY.

CRANBURY, - - - ABIJAH APPLEGATE, *Cranbury.*

EAST BRUNSWICK, - - RICHARD SERVISS, *South River.*

MONROE, - - CHAS. D. APPLEGATE, *Cranberry Station.*

NORTH BRUNSWICK, - JOHN W. BODINE, *Franklin Park.*

PISCATAWAY, - - - - NATHAN VARS, *Dunellen.*

The past year has been marked by an unusual amount of sickness. The extreme warmth of the winter of 1878-9, has had a marked effect upon the conditions of health of our township, and the inhabitants have been, as a consequence, exposed to a greater degree of sickness. Diseases caused by miasmatic influences have been more frequent than for many years. Intermittent and remittent fevers have been quite prevalent during the summer and fall, and a number of cases of typhoid fever, (which are rare indeed here,) have been observed.

In consequence of this miasmatic influence, other diseases seem to have partaken, to a certain extent, of the periodical character of intermittents, and the severe characteristics seem still to prevail.

These influences have been more general than local, although some local sources of disease have existed. I might mention, as such cause, our proximity to the mill pond at Bound Brook, which has had a very perceptible effect upon the health of our citizens residing in that immediate vicinity.

RARITAN, - - - - THEO. A. WOOD, *Metuchen.*

Public health has been generally good, except some malarial disease. The rate of mortality is less than for any year since the organization of the township. The Board of Health has done much to further the drainage of a brook through the village.

SAYERVILLE, - - - - E. E. HILLMAN, *Sayerville.*

SOUTH AMBOY, - - - A. APPLEGATE, *South Amboy.*

SOUTH BRUNSWICK, - - C. M. SLACK, M. D., *Dayton*

A typho-malarial fever accompanied by apthores sore mouth prevailed somewhat in the fall.

WOODBRIDGE, - - A. A. EDGAR, *Woodbridge.*

MONMOUTH COUNTY.

EATONTOWN, - - ABRAM T. METZER, *Eatontown.*

Malarial diseases have been unusually prevalent, assuming mostly an intermittent form. The only complaint of nuisance made to the Board was promptly attended to.

FREEHOLD TP., - . - CHAS. F. RICHARDSON, *Freehold.*

Refuse and excreta are removed in a primitive way. Privies are located near the houses, and are cleansed when the owners or tenants please, except when complaint has been made to us, and we have ordered cleansing. Several complaints have been received which were investigated and remedied. * * A plan of sinks and odorless excavation should be adopted and enforced here. A careful meteorological summary accompanies the report.

HOWELL TP., - - - J. LUTZ, *Farmingdale.*

The township has always been remarkably free from malarial diseases.

MANALAPAN, - - JOHN VAN DOREN, *Manalpan.*

MATAWAN, - - - - - BENJ. GRIGGS, *Matawan.*

Malarial fevers have prevailed this year to an extent before unknown in this township.

MILLSTONE TP., - - - PETER FORMAN, *Manalapan.*

NEPTUNE TP., - - - *Report from Ocean Grove,*
DR. HENRY MITCHELL, *Ocean Grove.*

TO DR. E. M. HUNT, *Secretary State Board Health:*

In compliance with the requirement of Sec. 4, of "An act concerning the protection of the public health, and the record

of vital statistics relating thereto," approved March 11th, 1880, the Board of Health for the Borough of Asbury Park respectfully report:

The district over which this Board has supervision is located in Monmouth county, Neptune township. In form the territory of the borough is nearly a square. It is bordered on the north by Deal Lake, a tide-water inlet, about one hundred and fifty yards average width; on the west by the road bed of the Long Branch branch of the Central Railroad of New Jersey; on the south by Wesley Lake, and on the east by the Atlantic ocean. The ocean front is about one mile in length; the distance from the railroad to the sea is about three-fourths of a mile.

Ten years ago this district was literally a wilderness, being then covered by a dense growth of pine and oak, with an undergrowth of bushes through which a human being could scarcely pass unless aided by an ax.

At present the whole borough is laid out in streets, building-lots, parks, etc., and the permanent population, as shown by the recent census, is now sixteen hundred and forty (1640,) while the summer population, during the past season, reached fifteen thousand (15,000) during a period of three months.

The soil is sandy, with an underlying stratum of clay, about seven to fifteen feet beneath the surface. The clay bed is from three to seven feet in thickness, and is underlaid by a stratum of gravel. Below the gravel is another layer of clay, and the well pipes are driven through this second stratum.

The water taken from these wells has, thus far, been generally good, but several instances have come to our notice where wells have been contaminated, and a movement is now being made by the authorities to secure the introduction of water from a distant point. There appears good reason to expect that an abundant supply of pure water will be furnished to the people of the borough within the coming eight or nine months.

In contour the borough is nearly level, but there is sufficient unevenness of the surface to afford good drainage. There is a fall of four inches to one hundred feet from the railroad to the sea, and from the southern boundary to Deal Lake there is a fall of eight feet. Sewers have been laid (with ten inch tile) through First, Second, Third and Fourth avenues, and in Kingsly and Hick

streets, draining and taking sewage from about one-fourth or one-third of the most populous portion of the borough. A force of men is now at work extending the sewer system.

The streets are wide. All of the avenues leading to the sea are 100 feet wide, increasing to 200 feet toward the shore.

The parks in the borough are numerous, though but two of them are of large size, as the accompanying map will show.

The buildings are, for the most part, light frame structures, with ample piazzas, intended for summer occupation only, though within the last two years a better built and more permanent class of dwellings has been erected.

There is no difficulty in making good cellars in almost all parts of the town, and considerable care is manifested on the part of owners to promote health by cementing cellar bottoms, and also in ventilating incline spaces over unexcavated ground under dwellings.

The usual size of building lots is 50x150 feet, affording opportunity for free circulation of air.

Kerosene oil is chiefly used for obtaining artificial light, though the public buildings are generally lighted by gas, manufactured on the premises from gasoline.

Garbage and other house-refuse is collected daily by the borough carts, and deposited outside the corporation limits. This service was performed very satisfactorily during the past summer, few complaints of neglect having been received.

Privies are made in accordance with a borough ordinance which requires them to be made of brick—bottom and sides—and to be cemented on the inside and made water-tight. They are excavated by the odorless excavator.

There are no slaughter-houses nor any hog-pens within the borough.

The public school building is a large and fine edifice, erected three years ago at a cost of ten thousand dollars, exclusive of the ground. It has accommodation for five hundred pupils. The present attendance is about three hundred.

The only prison in the borough is the police station. It is kept scrupulously clean, and is suitable for the purpose for which it is used.

A new steam fire engine was recently purchased. This ap-

paratus, together with several carbonic acid fire extinguishers, seems to afford sufficient protection against fire.

There is no cemetery nor burial place within the borough.

The public health has been good during the past year. No epidemic, nor any prevailing disease has existed. Not a single case of typhoid fever has occurred here, to our knowledge, during the past year.

So far as we can learn, this locality is exempt from malarial influence. No form of malarial disease has ever been prevalent here, and we believe no case of intermittent fever has originated here. Intermittents and malarial neuralgias which are brought here yield readily to treatment. The Health Board has an Inspector.

SHREWSBURY TP., - - W. A. SICKLER, *Red Bank.*

RED BANK, (in the township), - H. J. CHILD, *Red Bank.*

Refuse is removed from vaults by a steam pump with tight barrels. The primary departments of schools are overcrowded. The Board, since its organization, has had sixteen complaints and served twenty-six notices. Through the request of the Board, some of the gutters have been flagged.

UPPER FREEHOLD TP., - - WM. ROBBINS, *Allentown.*

Allentown has special drainage in one street and first-class school provisions.

MANASQUAN, - - - - A. A. HIGGINS.

We have held several meetings but very few matters have been presented to us, excepting abatement of nuisances, in which few cases, the people have generally acquiesced in the suggestions of the Board. In this vicinity (on the ocean) there has been but one case of drowning, and in that no opportunity was afforded of applying means of resuscitation, as suggested by the State Board. There is an epidemic of diphtheria prevailing near Sea Plain, in this township, and at Ocean Beach, on south side of Stark River. Cannot account for it, except it be the

general prevalence of the disease at this season. Those attacked near Sea Plain live on the edge of a bog, which has been drained, and the water drank by them is principally surface water. There have been no other epidemics in this township during the year.

MORRIS COUNTY.

BOONTON, - - - - C. H. SIMONS, M. D.

TOWN OF BOONTON, - J. G. RYERSON, M. D., *Boonton*.

CHATHAM TP., - - MOSES M. OSBORN, *Madison*.

CHESTER TP., - - - W. A. GREEN, M. D., *Chester*.

No epidemics have visited us during the past year, though in the spring months we had a goodly number of cases of diptherite or diphtheria—for I regard them as one and the same, differing only in severity. We had also quite a number of cases of scarlatina of the mildest possible type, and in only three instances did anginose symptoms develop themselves to alarming extent. In one case we had nephritis as a complication, followed by anasarca. During the summer, we had comparatively few cases of cholera infantum. What few there were, with but a single exception, terminated in recovery; this was in an infant six months old. Ordinary diarrhœas were frequently met with and offered but little resistance to the ordinary methods of treatment. No well pronounced cases of dysentery occurred until the latter part of August, and this was of the variety known as bilious or malarial. It followed the course of Black river, near the swamp, all the way from Ironton to Hackleburne. All the cases recovered, and but little difficulty was experienced in bringing about convalescence. Fever of a malarial character has prevailed to no small degree; and in almost every disease that comes under our observation, we can discover a disposition to a paroxysmal exacerbation at some one time in the

twenty-four hours; this is generally controlled by a few doses of bark or some one of its alkaloids. This condition of affairs has grown more and more apparent for the last three or four years, prior to which time we scarce ever had occasion to administer bark as an anti-periodic. When it first began to develop itself, I attributed it in part to the unworked mines, (for at that time the mines were abandoned, owing to the general panic) and partly to the malarial wave, that seemed to be passing over a great portion of the country; perhaps both played an important part. When the mines were re-opened, last spring, the trouble seemed to augment, probably owing to the filth that was taken therefrom. Almost all cases of fever follow the several water-courses, or near them; on the hills we have a more varied class of diseases to contend with, mostly inflammatory in type. A great source of trouble is experienced in the Hackleburne district, in controlling certain diseases, particularly those of the bowels. This is accounted for by the location and surroundings: some dozen or fifteen houses, closely built together, occupied by miners, whose families are anything but neat in person or cleanly as regards the premises; all kitchen slops and waste, and very often chamber slops, too, are thrown in front of the door; the privies behind and above the houses, the water made foul by drainage, and the air impure by the water in the river and the uncared for cow-pens and pig-stys, all go toward rendering the locality one of the most unhealthy in the township. Much has been said and threats made about the place, but to no purpose, and the only thing left to do is to exercise the authority which is invested in this Board.

JEFFERSON, - - - SILAS & ROWLAND, *Milton.*

MENDHAM, - - - JOHN R. PITNEY, *Mendham.*

MONTVILLE, - - - JOHN BLOWERS, *Montville.*

MORRIS, - - - COLLINS WIER, *Morristown.*

MORRISTOWN, - - CHARLES H. GREEN, *Morristown.*

MT. OLIVE, - - - - ENOS G. BUDD.

The reports notice the excellent natural water-supply and the healthy character of the locality.

PASSAIC, - - OSCAR LINDSLEY, *Green Village*.

The township includes the Great Swamp, consisting of about seven thousand acres. The health of the township has been good the past year.

PEQUANNACK, - - E. W. MARTIN, *Pompton Plains*.

The habit, when numbering the school district, of inquiring if the children are vaccinated, is a good one.

RANDOLPH TP.,

DOVER TP., - - - - WM. H. LAMBERT, *Dover*.

The town is on the Rockaway river and well supplied with water. The poor are few and are taken care of by the township.

ROCKAWAY, - - - - - E. B. MOTT, *Rockaway*.

Malarial fevers are prevalent along the Rockaway river in summer, probably caused by the diversion of its water from its natural channel for canal or other purposes.

ROXBURY, - - - - J. T. LAWRENCE, *McCainesville*.

There has been considerable sickness from malarial fever. The Morris Canal has, of late, been quite thoroughly dredged, and the muck was thrown upon its banks and most of it has remained there. One case of nuisance was abated by the Board.

WASHINGTON TP. - - - B. LARUE, *Waughrightville*.

OCEAN COUNTY.

BERKLEY TP., - - - - C. F. BONNELL, *Bayville.*

JACKSON, - - - - - THOMAS P. BISHOP, *Cassville.*

The assessor reports the district as always exempt from fevers.

LACY TP., - - THOS. C. VANARSDALE, *Cedar Creek.*

No ponds or stagnant water are to be found in any part of the township. There are no malarial fevers and deaths seldom occur.

PLUMSTEAD, - - - A. S. BROWN, *New Egypt.*

The description of the township, especially of New Egypt, is that of a healthy section. The pines extend upon the south, and these, and the excellent water-supply, seem to promote the good health of the locality. The water from the cedar swamps seems to be purer than the usual surface water.

PASSAIC COUNTY.

ACQUACKANONK TP., - - NICHOLAS FREDERICK, *Passaic.*

MANCHESTER TP., - - MR. DE GRAY, *Hawthorn.*

Chills and fever and remittent fever have been prevalent this year.

PASSAIC, - - - - JAMES A. NORTON, *Passaic.*

PATERSON, - - CHAS. F. W. MYERS, M. D., *Paterson.*

In addition to report are sent valuable specimens of various blanks used.

POMPTON, - - - CORNELIUS TOWNSEND, *Wanaque.*

Burial grounds are mostly connected with churches. The question may be properly raised whether churches that are closely crowded upon by graves or not occupied during the week, do not become the receptacles of grave-yard air, and so risk the health of those who assemble on the Sabbath. Since it has become more common to have basements, or to have furnaces in small cellars under the building, there is more risk of an inflow of air laden with organic matter.

WAYNE TP., - - - - DAVID BENSON, *Paterson.*

There has been a good deal of malarial fever for the last two years. The effect of various feeds on cattle as producing disease is noticed. Corn meal, from which the sugar has been extracted, has somewhat taken the place of brewery grains. Aborting among cows is not now so common; this is an evil much complained of by farmers; it is an important inquiry whether diseased rye or other grains do not cause it.

WEST MILFORD, - - - A. S. TERHUNE, *West Milford.*

We quote from a letter appended by one of the physicians of the township.

During the past spring and summer there has been some dysentery, cholera morbus, &c., among the adults, and cholera infantum among children, but not in a fatal form. But the great affliction, or *curse*, if properly named, in West Milford and its environs, is malaria or chills and fever, intermittent fever, &c. It seems to be growing each year, increasing in area and assuming different types and shapes. There has been a number of cases of typhoid fever of a malarial type during the past two or three months, and some of them about sick enough to die, still I have heard of but one fatal case. What causes this malaria I am not entirely able to say, to my satisfaction, and I am quite sure I can't explain it to the satisfaction of all; I do not think it is caused by the badness of the people in West Milford. It is now prevalent to an alarming extent. Quinine cinchonidia, or some other antiperiodic, is a regular dessert for breakfast, dinner and

supper. Malaria around here enters into nearly every disease or complaint I have to deal with, even to child-bed, and I can't get through any of them without the use of quinine. I have been in this place over thirteen years, and for the first five years hardly a case of chills and fever was known any where around, but about eight years ago, when the Greenwood Lake and Montclair Railroad was commenced, intermittent fever, in its various forms, began; I ascribed it to the excessive throwing up of fresh earth, with its millions of little roots, &c., of vegetable matter rotting and decomposing, and throwing off a poisonous gas or fragrance of some kind. But eight years have past, and still the chills and fever, or malaria, is on the increase, and in parts of the community where the natural drainage is good, no swamps or marshes, and genuine mountain air, seemingly healthy and invigorating. The water in Greenwood Lake is very low, at present, owing to the fact that the Morris Canal Company has it under control, to a great extent, and can draw of the water to suit their convenience. A great quantity of vegetable matter is left to decompose, and the result is just what you can expect, a loathsome, disgustings mell all along the border of the pond, an odious gas of some kind or other, perhaps, or a malarial breeder. This, of course, is not at all times of the year, but it is so now, and seems to be the case whenever the Canal Company chooses to raise the water below the average water-mark. If nature had been let alone here, and not been tampered with by art, my impression is that malaria would hardly have been known around Greenwood Lake. The lake has been made larger by nearly two miles in length, land overflowed, a company made richer by it, and a neighborhood made sick. Cannot an act of legislation be made to keep the Canal Company within health limits? Will the State Board of Health of New Jersey take some action about it, find out if I am telling the truth, and if so, try, and not stop trying, till a remedy is found? Greenwood Lake is a pleasant, picturesque lake, surrounded by mountains, and is really a healthy place; air cool and bracing, and is destined, in time, to become quite a popular summer resort, if "not injured by man's device." I will say something also about public nuisances in this part of the country, and that will be about schoolhouses, privies and cemeteries, or country grave-yards. The public school privies are not well looked after by the trustees,

&c., and are allowed to become filled to the top of the ground with the excretions; no disinfectants, such as dry earth, coal dust, out of coal pit bottoms, are used, and the consequence is that a foul stench is emitted, disgusting and loathsome in every way. I believe that a privy, as a general thing, should be kept just as clean and sweet, to the eye and nose, as the teeth should be kept clean to preserve a good breath. I believe these bad kept privies of our country schools have a demoralizing effect on the children. Would it not be well for the Board of Health to tell the County Superintendents to speak to the teachers about this thing, when they are calling round among the schools under their charge? It wouldn't hurt our teachers, up this way, one bit, to have their County Superintendents ask if charcoal was made around here.

Another great nuisance in some parts of the country is the grave-yard, or burying-ground; such a one we have in the village of West Milford, in the shape of a grave-yard; this grave-yard is in the centre of the village, and on the elevated side of the street. The church is in the grave-yard. Private dwelling houses are situated on the lower side, or other side of the street. Each house has a well of water for family use, cooking and drinking purposes. What I mean is this, the water runs from the grave-yard in these wells, without doubt. I have heard one old sexton of this church tell me a number of times, that when graves were dug in certain parts of the yard, the wells of water would become roiled and muddled during the process of digging the graves. The children of the Sunday School drink out of these wells, and the children of the public school in the place patronize them, as the school has no well of its own, and if it had, the school-house is situated at the lower end of the grave-yard. This grave-yard is a confirmed nuisance; it is an old yard and the community still bury in it; the land is wet and soggy in the yard. There are a number of good locations within a quarter to a half mile from the village for a cemetery or grave-yard—soil dry and pleasant. I urge strongly on the State Board of Health, that the matter be looked into, and, if I am correct, that an act in the Legislature be passed preventing any more burials taking place in this grave-yard.

SALEM COUNTY.

LOWER ALLOWAY'S CREEK, W. B. RIDGWAY, *Hancock's Bridge.*

LOWER PENN'S NECK, - - WM. NEWELL, *Pennsville.*

QUINTON, - - - A. G. MCPHERSON, *Quinton.*

SALEM CITY, - - - - J. D. FERRELL, *Salem.*

Its Board of Health was late in organization, but is now fully organized.

UPPER PENN'S NECK, - - GEO. W. HEWITT, *Pennsgrove.*

Three other townships have Boards of Health, but have made no special report. The health of the county seems to have been remarkably good.

SOMERSET COUNTY.

BEDMINSTER, - - - WM. P. SUTPHEN, *Bedminster.*

A fever of remitting, intermitting and typhoid types has prevailed in the southern central portion of the township for a period of three months. The clearing of timber from a tract of land embracing about seventy acres has been in progress about four years; a portion of the timber was manufactured into charcoal, while much more was permitted to decay on the ground. During the coaling, the neighborhood was clear of fever; after that ceased, fever commenced in the vicinity, and upon the high lands adjacent. The land was low, in spots marshy from blind springs, and the soil a clay subsoil. During the latter part of the month of September, in 1880, the village of Pluckamin suffered from fever to a degree approaching an epidemic. Due notice having been given, the Board visited the village officially, on the fifth day of October. The sewerage, cellar drainage, condition of wells, cisterns, cesspools and privies were examined,

taking one day's research. Cases were found that demanded prompt action. Property owners were at once notified, requiring sewerage, cleansing of wells, cellars, privies, &c. In every instance, the Board are pleased to say, that their demands were complied with, and a general cleaning of the town was the result. Up to the date of this report no deaths have occurred in that vicinity from fever, and its force appears exhausted, as but few new cases in that vicinity are reported.

BRANCHBURG TP., - - A. J. AUTER, *North Branch.*

BRIDGEWATER TP., - - WM. J. POTTER, *Somerville.*

Chills and fever, or malarial fever, has prevailed in Bound Brook, so that scarcely a person in the village or vicinity has escaped. The Board of Health was called there in July last, to examine the condition of the mill-pond adjacent, and other places, to ascertain the cause of the unusual sickness. The Board met several times at the request of the citizens, and heard testimony in regard to the matter, and finally declared the mill-pond and dam a fruitful source of the disease seriously affecting the health and endangering the lives of the inhabitants of that vicinity, adjudged it a nuisance, and ordered the owners to abate and remove the said nuisance between the first and tenth of November; and that in case of failure to do so, the Board would proceed to remove the same, and charge the expense thereof on the lands. The parties had been previously indicted by the grand jury, and the case was tried in the courts before this time expired, the owners enjoined, and the court ordered them to abate the nuisance. They immediately removed the same by taking it all out to the foundation, and are preparing to drain the pond by making a channel through the central part with lateral drains on either side.

FRANKLIN TP., - - D. J. VOORHEES, *East Millstone.*

Malarial fevers prevailed to some extent. The Board took measures to secure full returns of vital statistics.

HILLSBOROUGH, - - - DR. C. R. P. FISHER, *Neshanic.*

MONTGOMERY, - - - WM. OPPIE, *Harlinger.*

Some cases of malarial fever are reported.

NORTH PLAINFIELD, - - ISAAC BROKARV, *Plainfield.*

It is claimed that the death rate is increased by the temporary residence of invalids.

WARREN TP., - - GEO. TERRELL, *Warrenville.*

SUSSEX COUNTY.

ANDOVER, - - - - G. C. COOK, *Andover.*

The great neglect of vaccination is noticed.

BYRON, - - C. K. DAVIDSON, M. D., *Starhope.*

Malarial affections prevail in the southern portions of the township.

FRANKFORD, - - EDWARD ROE, ASSESSOR, *Branchville.*

Land drainage is common and the water-supply good. Among animal diseases, foot-rot is noted as prevalent.

HARDYSTON, - - JESSE DENNIS, *Franklin Furnace.*

Malarial diseases were very prevalent during the summer and fall. Water is supplied from the Wallkill and Pequannock rivers and their branches, which are sluggish. Some of the tenement houses of operatives are in bad condition.

NEWTON, - - - GEO. HENDEN, *Newton.*

Meteorological Tables are carefully kept at the Newton Library byDr. Ryerson under the direction of the State Board, and will serve to indicate the climate of this portion of the State.

SANDYSTON, - - - WARREN VAN SICKLE, *Layton.*

Scarlatina as an endemic existed to quite an extent last winter and in the early spring. During the summer and early fall, intermittent fevers were quite prevalent, caused, no doubt, by the extreme dry weather exposing decomposing vegetable matter.

SPARTA, - - - E. R. POTTER, M. D., *Ogdensburg.*

STILLWATER, - - - C. O. MOORE, M. D., *Stillwater.*

Malarial fevers, of the intermittent type, have been prevalent with quite a number of cases (mostly sporadic) of typhoid and typho-malarial fever.

VERNON TP., - - - CARLOS ALLEN, M. D., *Vernon.*

The Black Creek runs through the valley having extensive drained lands on either side. From these lands or from some other cause, unknown, there has been much malarial disease in the township of late years.

Drainage of wet lands (in other parts) has been effected to a great extent by owners, for agricultural purposes, which checked intermittents in the locality very much. A disease known as "Black Leg" has been reported among calves but is not contagious.

WANTAGE, - - - W. S. VONDERHOFF, *Deckertown.*

Malarial fever and ague have been common in the low lands along the Wallkill and to some extent throughout the township, induced, in my opinion, by long continued dry weather. In ordinary seasons it is unknown.

Abortion, or premature delivery of calves, causes great loss to our dairies.

UNION COUNTY.

CLARK TP. - - - - - - W. H. COLES, *Rahway.*

Printed before as a sample of a brief summary.

ELIZABETH, - - - - PETER BONNETT, *Elizabeth.*

The city has a Health Inspector.

C. The water supply is abundant, and is drawn from the Elizabeth River, about a mile and a half from the populous part of the city. The Water Company's pipes are extended over a large part of the city. In other sections, good water is obtained from wells. Some complaint is made during the summer season of smell and discoloration in the city water. This is probably due to vegetable matter in the reservoir, and is a common annoyance in many places.

D. The sewer system is extensive and, in most parts of the city, in advance of the needs of the inhabitants. The only real defect is the use of the Elizabeth River as a drainage outlet, which in consequence becomes very foul and offensive and cannot, in that condition, fail to be detrimental to health.

FANNWOOD, - DR. F. W. WESCOTT, M. D, *Scotch Plains.*

LINDEN, - - - - - C. J. BROWN, M. D., *Linden.*

Reference is made to the pollution and stench from Peach brook, which is substantiated by many persons, and seems to require the action of the Board.

NEW PROVIDENCE, - - JOHN WOOD, *New Providence.*

The Board reports some special investigations in the township.

PLAINFIELD, - - - H. H. LOWRIE, M. D.

The excavations known as the Gravel pits, which have been supposed to be the cause of disease for some years, have at last been filled and rendered perfectly healthy. Another source of complaint is a mill-pond, bounding the city on the west, which we hope to have remedied.

RAHWAY, - - - LEWIS S. HYER, *Rahway.*

The assessors take record of all not vaccinated. Some of the

physicians are dilatory in sending in returns of births. The introduction of water on the high pressure system does away with the necessity for fire engines.

SPRINGFIELD, NICHOLAS C. JOBS, M. D., *Springfield.*

The diseases that prevail during the summer and winter are alike complicated with malarial poison so much that many yield alone to quinine, as, for instance, a bronchitis gets well under the influence of the bark better than when expectorants are relied upon. There have been only a few cases of scarlatina, and those of a mild type; a few of diphtheria; a lesser number of dysentery than in former years, while of the malarial forms, there have been frequent types of bilious or remittent, typho-malarial and congestive fevers. The pulmonary diseases, especially the forms of phthisis, are greatly aggravated and hastened in their course by the periodic and high fevers which the patients have, and which do not scarcely yield at all to any of the anti-febrile remedies. Those that ordinarily relieve the night-sweats do not have any effect unless combined with quinine. The public school is in good condition as regards the heating and ventilation. Were it not for "malaria," the people would be healthy, happy and prosperous.

SUMMIT, - - GEORGE W. NICHOLAS, *Summit.*

Malarial fevers of the intermittent form are slightly prevalent on the low lands. Hope to check the disease by enforcing sanitary regulations.

Evils have been arrested and the community has been awakened to the importance of guarding against disease by cleanliness both of person and dwellings.

UNION TP., - - - - JOHN LEONARD, *Union.*

Malarial fevers have been prevalent in many parts of the township.

The credit given in this report to the State Board for stamping out pleuro-pneumonia, depended much upon the efficient co-operation of the local Board of Health and of owners of cattle.

The extreme lowness of all streams during the summer is

noted. An effort has been made to convert a portion of the "Turf Meadows" near Connecticut Farms into a lake, but only a little progress has yet been made.

WESTFIELD, - - - - - JOHN M. C. MARSH.

The efficient action of the Board was important in checking small-pox in one locality.

WARREN COUNTY.

ALLAMUCHY, - - - - WM. SEALES, *Hackettstown.*

FRANKLIN, - - P. S. CLEVELING, M. D., *Broadway.*

General health good, but fowl and hog cholera have occasioned considerable loss of stock.

FRELINGHUYSEN TP., - T. RORBACH, M. D., *Johnsonbury.*

There has been unusual exemption from intermittent, remittent and other fevers.

GREENWICH, - - - S. W. WEIDER, *Reiglesville.*

The general health has been good. The losses from hog cholera are from five hundred to one thousand dollars.

HARDWICK, - - - J. S. VOSS, *Marlsboro.*

HARMONY, - - - I. K. VANNATTA, *Harmony.*

There are seven school-houses in the township, only one of which is a good one. Two are in cemeteries, and it is worthy of inquiry, whether such a locality is good. Cholera has largely prevailed among swine. It has been noticeable that farmers who lived on the hills were exempt.

KNOWLTON, - - - LEWIS C. WELLER, *Columbia.*

LOPATCONG, - - - J. YIESLEY, *Phillipsburg.*

PHILLIPSBURG, - - - - - J. P. SWEENY, *Phillipsburg.*

The Board of Health has found some difficulty in its work, but has pushed forward without fear or favor.

TOWN OF WASHINGTON, - WM. BAIRD, M. D., *Washington.*

Possibly one, if not the most important sanitary subject in our town, is the question of sewerage. Our town is particularly free from typhoid diseases and so called zymotic affections, whether this is due to the general use of cistern-water I am unable to say, but with good sewerage there is no reason why this town should not remain with a very small death rate. We are badly situated for getting a water-supply through pipes, and so cisterns will no doubt be used for a long time, or until the town increases materially in wealth and size. This fact, taken with its present size, makes the town well adapted to the earth closet system, and I believe if our townspeople were instructed through the State Board, or by pamphlets, as to the importance of this system, that dry earth and removals at regular intervals would take the place of foul vaults and cleansing every 4 or 5 years. The health of our town is not materially effected by these things as yet, but it is our duty to keep it in its present healthy state.

WASHINGTON TP., - - WM. C. CAMPBELL, *Washington.*

The reports include many more items of local and industrial interest, and as placed on file, will afford important reference as to most of the localities in the State. The faithfulness of observations and the general ability shown in these returns vindicate the present construction of our Health Boards. While there are some township officers who are not fully awake to the importance of this oversight of health, it is because they have not yet had time to become intelligent as to existing needs. Each year will increase local attention, except in those rare instances where there is opposition to all progress.

SUGGESTIONS TO HEALTH BOARDS.

In addition to other directions, to be found in this and other yearly reports of the State Board, it may be added:—

I. Let each Township Committee at its usual meetings, when the assessor is present, sit also as a Health Board and enter the fact in the township health book, together with any item of business.

II. Whenever new officers are elected, there should at the first meeting be an entry in the health book of the names of the Health Board as thus made.

III. Where there is no township physician as a member of the Board, some of the Boards have invited some adjoining physician to act as their adviser.

IV. Carefully examine all laws relating to the construction of local Boards and their duties. Correctness and promptness of action are most important. The failure of a law is oftener in delay or mistakes in its administration, or in technical errors than in the defects of the law.

V. The reports of the State Board of Health as sent are not the property of individuals but of the Board. The keeper of the town health book should keep control over them and see that when loaned to others they are returned to him, and passed over into the hands of the succeeding officer.

VI. We ask the same promptness in future annual reports as in these, and that the few who have failed to organize, or to make full report, will fully arrange at the first meeting of the Township Committee, and notify us.

VII. As the returns of marriages, births and deaths, so much indicate the progress and health of communities, and are essential in the study of local conditions, all Boards should insist upon prompt returns, and report to the Secretary of State any omissions. It is, too, the legal right of every citizen to have such a record. Any neglecting returns are liable to suit at law.

VIII. All communications should be addressed "State Board of Health," or "Bureau of State Vital Statistics," State House, Trenton.

TYPHUS FEVER.

BRIEF MEMORANDUM OF TYPHUS FEVER AS NOW PREVAILING IN CAMDEN COUNTY ALMS-HOUSE.

About the middle of January, after the Report of the Secretary had gone to press, a request was received by the Secretary of the Board from a Freeholder Committee of Camden county and from the physicians of the Alms-house, that the Board would give attention to a fever prevailing at that institution which had already caused sixteen deaths, but the character of which was not yet fully certified. Our first visit was made January 17th, and a preliminary report the day after. We abstract from that report as follows:

Between November 24 and the date of my visit, there had been about fifty cases of fever, with symptoms very distinct from remittent, and not having the usual symptons of typhoid fever. We sought the history of the first ten or twelve cases that had occurred. The first patient was living, and was able to give an intelligent account of himself immediately previous to his attack. He had been working during the summer at Ellisburg. About the fourth or fifth of November, he went to Philadelphia, where he remained about a week, with very indifferent self-care. He lodged in two mens' lodging houses, which he describes as of the lowest kind; the crowded rooms were occupied by about twenty others, and a few days after his return home, he became ill, and was brought in a semi-unconscious condition to the alms-house, November 24th, and placed in a small room about 12x12 with three other persons in it. On December 6th, one of his room-mates was taken sick with the same fever, and the other two soon after. In the next room on the left, occupied by two persons, both were taken sick. Cases soon followed in the two rooms on the opposite side, across an eight feet hall. The first ten or twelve cases were just in this section. In the two rooms adjacent, and the three rooms opposite very few escaped. Three of the patients, one of the nurses and some others were able to give numerous facts as to the progress of the disease. The disease had never showed itself in the women's department of the same building. Taking all these facts and some others, as well as the charac-

ter of the fever into consideration, it seems very probable that the occasion of the sickness was the introduction of a contagious disease in the person of the first patient. It was, however, important to examine into other possible sources, or to see whether a fever that had been thus introduced was rendered unusually severe by bad household or local condition. The details as to the examination of water-supply, sewer system, and all sanitary construction, will be given hereafter.

The great defect that at once expresses itself is that of over-crowding. In November and December, the new part not having been in full occupancy, and the number of inmates being greatly increased, there was also an increase of crowding. We found seventy men in two adjacent rooms, 20x80 and 20x70, respectively. The closeness of beds in dormitories and rooms is still worse. Those who are sick are now crowded into entirely too small spaces, and the nurse force is wholly insufficient. While the physicians are doing everything in their power, it is to be feared that the high rate of mortality will not be avoided, and occurrences of new cases prevented until a system is adopted just the same as is in operation in our best hospitals. There is danger that the disease may spread into the adjacent district, unless the greatest precautions are taken, or that the whole institution may become so infected, as to repeat the experience of some others which have continued to have new outbreaks from the old virus, through successive seasons. While more details will be given in the full report when made to the State Board of Health, it seems proper that in view of the present emergency this preliminary statement should be made.

Respectfully, EZRA M. HUNT,
Secretary of State Board of Health.

Continued correspondence urged the rapid adoption of a hospital and separative system. On account of imperfect discipline and doubts as to exercise of authority, some delay occurred. At my next visit I was accompanied by Prof. C. F. Brackett, President of the Board, and Dr. F. Gauntt, member of the Board from Burlington County. We all earnestly insisted that the fever was of so serious a character as to be regarded as a pest which might easily be extended through the adjoining district. The Freeholders were advised to give to the physicians full power of stewardship, and to perfect a system of quarantine by which all well patients after fourteen days could be removed. The rate of mortality had decreased after a little relief of the over-crowding and the use of disinfectants. To this date there have been about seventy cases and twenty-five deaths.

Post-mortems advised by the Board and conducted by Prof. Tyson, of Philadelphia, as also other examinations of specimens by Prof. Pepper, leave no doubt that the disease is typhus fever. *Our report next year* will contain fuller details of cases as also of a thorough examination into local conditions.

It seems a coincidence that remittent fever at Bound Brook, typhoid at Princeton, and typhus in Camden county, should have in one year furnished such wonderful fields for typical study, while small-pox as a contagious disease which can be prevented has also had too much sway. The occasion for a close investigation of preventible diseases seems thus greatly impressed upon us, while other still more common zymotic diseases invite our constant attention and care. These whole series of cases have fully impressed upon us the importance of preventing such outbreaks and the need of prompt sanitary methods in their abatement.

SUBSOIL DRAINAGE.

THE SANITARY REQUIREMENTS OF SUBSOIL DRAINAGE OF THE SITES OF TOWNS AND CITIES.

BY ASHBEL WELCH, C. E.

All we have to say rests on the proposition that *wet soil is unfavorable to health.* As this will hardly be disputed, we shall not attempt to prove it, but merely enumerate some of the injurious effects of wet soil.

In hot weather the moisture from it facilitates the development of disease germs or specific poisons, whatever disease germs or specific poisons may be, and also their transport from place to place. That moisture facilitates the evolution of deleterious gases. Even where there is nothing to decompose, it causes an injurious excess of vapor. In cold weather the evaporation from damp soil uses up some of the needed heat, making the ground, in some cases, ten degrees colder than it is found to be after being drained.

Dampness also makes the human body more sensitive both to heat and cold. In the dry climate of Minnesota many degrees below zero are quite bearable; on the other hand, we all have felt a temperature of eighty degrees harder to bear on a damp day, than one of ninety degrees is on a dry day. Breathing an atmosphere of vapor by skin and lungs, instead of all air, or nearly all air, has a depressing effect, tending to produce disease, or predispose to it. One reason why mountain air is so invigorating is that at night the atmosphere of vapor is tenuous in comparison with the air, and so we breathe more air and less vapor. The depressing effect of hot weather, and the invigorating effect of cold weather, are probably due more to the greater or less amount of vapor than to the direct effects of heat or cold.

Under some conditions, a wet soil helps to produce one great

class of diseases, such as malarious, and to spread and intensify the zymotic; under other conditions, it produces another great class, such as rheumatism and coughs and consumption.

Doubtless the recent wide extension of the practice of excessive watering of streets in hot weather, is one cause of the increased sickliness of many places, and especially of the spread of malaria to places where it never prevailed before. This comes not only from the moisture, but from the fumes of the street filth, which the moisture assists to solve. The evil is intensified by the excessive foliage in some places, especially close around dwellings. Some persons, perhaps many, on reaching a watered street on a hot day, are unmistakably sensible of its depressing effect. Dust is bad, but dampness and malaria are worse.

The driest countries in the world, such as Egypt and Algeria are the healthiest, except when the heat is excessive; and these far healthier than damp countries equally hot.

Offices in basements, and dwellings of the poor in cellars, even at Liverpool, are notoriously unhealthy. Cellar kitchens are saved from unhealthiness by their open fires.

As there is everywhere an atmosphere of at least very tenuous vapor, some amount of it is doubtless necessary to health and comfort. It is therefore conceivable that a place may be too dry. But it is not likely that a place will ever be found or made too dry in this country.

It may be said that the air in a hot stove room becomes so dry as to produce headache; and that in hot weather the moist air around a playing fountain is refreshing. The headache comes from other causes. The coolness produced by the evaporation of spouting water is refreshing to most persons, in spite of the increased moisture, but to some the depression from the moisture more than counterbalances the coolness.

In 1862 Dr. Henry L. Bowditch, of Boston, read a paper on the connection between moisture and consumption, before the Medical Society of Massachusetts, showing the comparison, after several years of observation and inquiry, of one hundred and eighty-three townships in that State, and also of many single localities and dwellings. He found that in the one hundred and twenty-eight localities where moisture prevailed, consumption prevailed in one hundred and thirteen, and was rare in fifteen and that in the sixty-two townships where dryness pre-

vailed, consumption prevailed in twelve, and rare in fifty. That is, it prevailed in eighty-eight per cent. of the wet localities. and in less than twenty per cent. of the dry.

Much the same result was afterwards independently arrived at by Dr. Buchanan in 1866. After a wide and cautious induction from examination of localities in the three southeastern counties of England, he sums up as follows: "Wetness of soil is a cause of phthisis to the population living upon it." His facts would justify a much stronger statement.

The Registrar General of Scotland, in his seventh annual report made about a dozen years ago, speaking of Dr. Bowditch's conclusions, says in confirmation, that in five of the largest towns in Scotland consumption is most rare where the soil is driest, and little more than half as frequent in the very driest as in the very wettest.

As we should expect from what has been said it has been found that impervious and retentive soils (undrained) are more unhealthy than porous soils; that flat ground and that in which there are undrained hollows are more unhealthy than sloping ground of the same materials; and that glacial drift, being less pervious, and having more isolated hollows, is likely to be more unhealthy than diluvial gravel or sand.

It does not necessarily follow from what we have said that the proximity of streams or ponds, if the water is pure, is specially injurious to health. The evaporation from wet soil is continually forming and keeping up an atmosphere of vapor of considerable density immediately around us, that from neighboring waters being diffused, becomes more tenuous before it reaches us. The vapor from subsoil water brings up impurities from the ground into our very presence, while that from pure water does not. Evaporation from the ground chills it under our very feet; that from streams cools only the water and the air at some distance. But more than all, when the ground is dry the air circulates in it, and neutralizes its impurities.

So, in the somewhat analogous care of houses, damp from recent contruction, it is well known that they are unhealthy and depressing, predisposing to diseases of the lungs, rheumatism and epidemics.

Probably no one will question the fact that a site, naturally wet, is made more healthy by being well drained. But the extent

of the improvement in health by drying the soil, is probably appreciated by but few.

In 1867, Dr. Buchanan made for the Privy Council of Great Britain, a detailed report of the sanitary improvements that had been made in twenty-four towns in England, or cities as we would call them, and of the death rates before and after those improvements were made. Among the many particular effects of the improvements which he points out in each of these towns, one is the drying produced by the improvements. In a little less than one-third of the cases he reports "much drying," in a little over one-third of the cases, "some drying," and in the remaining third "little or no drying," or some equivalent statement. The following table, compiled from his statements, shows the decrease after the improvements were made, of the general death rate, excluding deaths from cholera during these epidemics, the consumption death rate and the typhoid fever death rate. We have grouped the towns according to the amount of drying. Dr. Buchanan recognizes the beneficial effect of drying, especially in consumption, but he does not seem to have seen what this table shows, the great extent to which the decrease of death rate was owing to it.

From Dr. Buchanan's report: Decrease in death rate, excluding epidemic cholera, after sanitary improvements made about 1855.

Column 1, name of town; 2, amount of drying; 3, deaths in 10,000 before improvements; 4, deaths in 10,000 after improvements; 5, per cent. of decrease from all causes but cholera; 6, per cent. of decrease from all causes but phthisis; 7, per cent. of decrease from all causes but typhus; 8, from cholera.

1	2	3	4	5			6			7			8		
Salisbury	Much Drying, 6.	240⅝	219	9			49			75			194		
Ely		239	205½	14			47			56			22		
Banbury		234	205	12½			41			48			42		
Macclesfield		296	237	20			31			48			10		
Croyden		533	190	18½			17			63			50		
Cardiff		296	226	24			17			40			290		
Liecester	Some Drying, 10.	264	252		4½			32			48			11	
Rugby		191	186		2½			42			10				
Worthing		155	153					36			*23				
Newport		250	216		23			32			36			125	
Cheltenham		194	185		4½			26			37				
Bristol		245½	242		1½			22			33			94	
Dover		222	209		6			20			36			55	
Warwick		227	210		7½			19			52			10	
Merthyr		301	262		13			11			60			371	
Ashby		216	202½		9			*19			56				
Stratford	Little or no Drying, 8.	217	202			7			1			67			
Penzance		221	222						5			*6			
Bryn Mawr		263	232			11			*6			56			100
Morpeth		260	247			5			8			40			25
Chelmsford		196	215			*						*5			4
Penrith		253½	250						5			55			11
Carlisle		280½	261			7			*10			2			28
Alverick		233	247			*6			*20			36			205
Totals	24	5,762	5,276	98	71½	24	202	222	17	330	345	245	608	666	878
Averages		240	220	16⅓	7⅛	3	33⅔	22¼	2	55	34½	30½	101	67	47
Mean Averages				8			17			38					

From the foregoing table it appears that the whole number of deaths from other causes than epidemic cholera, before the sanitary improvements, in the 24 towns averaged 240 per annum for every 10,000 inhabitants. The number of deaths from consumption averaged 33 per 10,000, and from typhoid fever 13. This leaves 194 deaths per annum per 10,000 from all other causes than cholera, consumption and typhoid fever. Or out of every 1,000 deaths from other causes than cholera, 137 were from consumption, 54 from typhoid fever, and 809 from other causes:

	Total.	Cons.	Typh.	Other.
Before improvements	1,000	137	54	809
Decrease when "much drying"	163	46	30	87
"some drying"	71	30	19	22
"little or no drying"	30	....	16	14
Decrease per cent. when "much drying"	16.3	33⅓	55	10⅜
"some drying"	7.1	22¼	34½	2⅜
"little or no drying"	3	....	30½	1⅜
Decrease due to "much drying"	133	46	14	73
Decrease independent of drying	30	....	16	14
Decrease per cent. due to "much drying"	13⅓	33⅓	24½	9
Decrease per cent. independent of drying	3	....	30½	1⅜

It would seem fair to infer that the decrease in the general death rate due to "much drying" where that took place, averaged 13⅓ per cent.; to "some drying," where only that took place, 4 per cent.. and to all other causes together, 3 per cent.; that the decrease of the consumption death rate due to "much drying" averaged 33⅓ per cent.; to "some drying" 22 per cent.; and to all other causes together nothing: that the decrease in the typhoid fever death rate, due to "much drying" averaged 24½ per cent.; to "some drying" 3½ per cent.; and to other causes 30½ per cent; and that the decrease in the death rate from all other causes than cholera, consumption and typhoid fever due to "much drying" averaged 9 per cent., to "some drying" 1 per cent. and to all other causes 1¾ per cent.

Without claiming for these inferred proportions, exact numerical accuracy, or putting them to any extreme, we are fairly entitled to conclude that drying the soil had more influence in decreasing the general death rate than all other causes together. Tabulating and classifying according to any other kind of improvement, we fail to find anything approaching to the same uniformity or magnitude of result.

The decrease in the death rate from typhoid fever, apparently

due to "much drying," was only 45 per cent. of the whole, that from diarrhœa still less; while the whole decrease of consumption was due to it.

The tables show, as they ought to, that the diseases known to arise from other and special causes, are not so much affected by wetness of soil, though aggravated by it; and that consumption is produced mainly by it, as was already known. That is, the inferences from the tables, are, on those points, corroborated by existing knowledge, and therefore likely to be correct in other respects.

The deaths from cholera, during three epidemics, all occurring before the improvements were made, averaged 50 per cent. more in those towns where there was afterwards "much drying" and which were therefore, probably, wettest, than in those where there was only "some drying"; and 100 per cent. more than in those where there was afterwards "little drying" and therefore, probably, in some cases certainly, dry already. Looking at individual cases, however, we do not find the connection between cholera and wetness of soil so uniform as between the majority of diseases, especially consumption, and wetness of soil.

With very few exceptions, the decrease in the death rate in the particular cases, as well as the general average, was greater where there was "much drying" than in those cases where there was only "some drying"; and in those where there was "some drying" greater than those in which there was little or none. This approach to uniformity among so many cases excludes all suspicion of accidental coincidence.

The good done by the sanitary operations in those four and twenty English towns was, therefore, mainly, the drying effected. It is very possible that the sewers as carriers of sewerage, in some cases did more harm than good, the excess of harm being more than compensated by the good they did as drains.

And yet, in most cases, this drying of the subsoil was not the thing particularly aimed at. The sewers were to carry off sewage and storm-water, and where there was any standing water, but the subsoil drainage was merely accidental or incidental. If the good effected so largely by accident has been so great, we may hope it will be much greater when the means are adapted to that special end.

We shall now consider those means.

Sewers and drains are built for three purposes: to carry off sewage; to carry off storm and hydrant water; and to drain the subsoil. We shall confine our remarks almost entirely to drains for the last of these purposes.

Sewerage, if water-borne at all, may be carried off by separate pipes, or by the storm-water sewers, according to the circumstances of the place. But we advocate a separate system of drainage, where the soil is wet, to carry off the subsoil water, for the following reasons.

In most soils, especially in wet and retentive soils, it is necessary, in order to get them well dried, to have the drains much nearer together than the sewers or the sewage pipes need to be, or can be.

Sewers need not, and should not, be many feet below the surface, except when they cut through a rising undulation of the ground. Drains, on the contrary, should be fifteen feet or more below the surface, so as to dry the soil to at least that depth, and to keep the deepest cellars dry. The deeper they are, the farther each way they will drain and therefore the farther apart they may be.

Drains can commonly run by the shortest and steepest lines to the nearest outlet. The almost constant flow being moderate in quantity is easily taken care of almost anywhere. On the contrary, sewers to carry storm-water must run on more regular grades, along lines of streets, and to some point, sometimes quite distant, whence a large quantity of water can run off without doing harm. If they carry sewage they should also reach a point perhaps still more distant, where it can do no harm.

A sewer, or pipe carrying sewage, must be tight, or else the deleterious matters or gases will escape into, and contaminate the soil, or the water in it. The soil, should not, therefore, be drained *into* them. It may be drained under, or alongside of such sewers or pipes; but it rarely happens that they are deep enough, or frequent enough, or run in the best direction. A sewer, even if it carried only clean rain-water, should not be used to drain the soil; for if it is not tight the water will run out of the sewer into the ground after a rain, by the same openings by which the subsoil water runs into the sewer at other times. This would keep the height of the subsoil water fluctuating, which is injurious to health. Drains unconnected with the

sewers keep the subsoil water at a uniform level. Water from cellars may be safely drained into subsoil drains, but not into sewers.

Before considering the position and construction of drains, let us first see where the water to be removed comes from, and how it comes. It may fall in rain or snow on the site; or it may be discharged there from water-works, sometimes to an amount that may equal, or exceed the rain-water. Or the water may come from somewhere else, by overland flow, or by percolation under ground. The mode and extent of drainage requirements are affected by the permeability of the soil, the position and inclination of the water, the slope of the surface, and the proximity and character of higher ground, and a proper place for discharge. One cardinal principle of drainage is to intercept the water as early, and as near its source as possible. As much as possible of the rain and waste hydrant water should be carried off at once over the surface or through sewers, and not allowed to sink into the ground, unless careful observation should show that an occasional rain-water subsoil washing does more good by carrying off impurities than harm, by varying the water-level, and in other ways. Overflow water from adjacent territory should be intercepted by channels, sewers or dykes, on the frontier of the site, so as not to come upon, and soak into the soil. Overflow of streams passing through the site may be guarded against by dykes, or what is better, enlarging their channel, or giving the channel a better section. A channel twenty-five feet wide and sixteen feet deep, will discharge one-third more than one of the sectional area of four times the width, and one-quarter of the depth. The width remaining constant, the capacity of the channel may be increased one hundred per cent. by adding to the depth only sixty per cent. In some cases, this deepening has not been done, from the erroneous supposition that it was of no use to make the bottom of a channel deeper than the basin into which it discharges.

The percolation of water underground from neighboring territory should be intercepted before reaching the site, if possible. That is commonly cheaper and more thorough. Often the water can be cut and carried off by a single drain, while if it is diffused over the site it would require many. Outside of the town the way is clear to drain to the best advantage; in the town

streets run wrong for draining, and foundations, houses, gas and water-pipes are in the way, and grades may not suit. The sooner the water is drained off the less it gets into the soil and the less harm is does.

Where such neighboring territory can be controlled, much may be gained by underdraining it all over. In most cases there should be a thorough and deep drain along the frontier of the town site to cut off the underground flow. A vertical stratum of open gravel should extend from the surface of the ground down to the drain, so that the water on reaching it shall immediately drop down through it to the drain. In some cases a course of sheet piling or thin cement wall may be necessary to prevent the water from crossing over the drain and going further laterally.

When the underground flow is too deep to be cut off, the drains should be as near as possible to the places where it rises, and as deep as possible so that it shall not spread, or rise high enough to do harm.

Drains should be fifteen feet below the surface if possible. They may be small round or rectangular unmortered culverts of stone or brick, pipes of terra-cotta or cement, tiles, &c. In any case they must be open at the joints or elsewhere to receive the water, be surrounded by open gravel or something equivalent, to exclude earth or silt, and a vertical stratum of gravel, even if only a few inches thick, should extend from the drain to the surface of the ground. Without this latter precaution drains may cease to take off the water at all from the soil some feet above them, after the filling over them becomes consolidated.

In many cases after sewering, the death rate has at first decreased, and then, after a while, increased nearly to what it was before. That is, the accidental effect of the sewer was to drain the soil so long as the filling around it remained open and porous, but when the filling settled and became nearly or quite water-tight, the drainage along the outside of the sewer ceased, the soil became wet again, and the death rate increased.

Cellars and foundations of dwellings should be kept dry, for if the cellar is damp the house will be damp. Some of the means besides the general drying of the locality, are cement or asphaltum floor and cemented cellar walls, or, at least, external cement

or asphaltum plastering upon them. A cement or asphaltum layer upon or under the surface of the ground, all around the house, to prevent the surface-water from running down to the foundation; and subsoil drains all around the foundations, and when necessary under the floor. Where possible, water should not be drained out of the cellars but kept out, not dried but kept from getting wet.

There should be no communication between cellars and sewers or sewage pipes. The poison given from them contaminates even ice. Separate drains are sometimes made on or alongside of sewers or pipes. It would be better to make them several feet below, and fill with gravel between.

It is quite possible that the uses for which sewers were intended, may, in some cases, have been productive of more harm than good, while their accidental effects were so great as turn the scale the other way, in favor of good. Streams of filth running for miles and miles through the sewers all over a city, pouring their poisonous gases through the openings into the streets, through the "modern conveniences" into the bed rooms, and through the kitchen sinks into the larders, may be worse than the evils they are intended to remove; but the accidental good they have done in those cases by draining the subsoil, at least while the filling around them remained porous, seems to have more than compensated for the harm. Now if this has anywhere been the case, it would have been a great deal better, as well as cheaper, to put subsoil drains there instead of sewers for sewage. Probably the improvement in many a sewered town is not due to sewerage, but to drainage; however this may be, there is no doubt about the great benefit of subsoil drainage, unless the ground is dry already.

METEOROLOGICAL TABLES.

Minimum, Maximum and Mean Temperature, at Newark, N. J., by Wm. A. Whitehead, for Years 1844 *to* 1880, *inclusive.*

YEARS.	MIN. TEMP.		MAX. TEMP.		MEAN TEMP.	Each Five Years.
1844	January 12,	3¾ degrees.	July 14,	92½ degrees.	51.21 degrees.	
1845	February 10,	3½ degrees.	July 14,	96¼ degrees.	51.37 degrees.	
1846	February 27,	1½ degrees.	July 10,	94 degrees.	51.66 degrees.	
1847	February 24,	0½ degrees.	July 19,	93½ degrees.	49.83 degrees.	
1848	January 11,	....	June 16,	94½ degrees.	51.25 degrees.	—51.06 degrees.
1849	January 11,	2¼ degrees.	July 13,	99¾ degrees.	50.89 degrees.	
1850	March 4,	9¾ degrees.	July 25,	93½ degrees.	52.86 degrees.	
1851	December 27,	7½ degrees.	June 20,	93¼ degrees.	51.76 degrees.	
1852	January 20,	2½ degrees.	June 16,	95¼ degrees.	50.57 degrees.	
1853	January 28,	6¾ degrees.	June 21,	97 degrees.	52.75 degrees.	—51.77 degrees.
1854	December 20,	2 degrees.	August 23,	99 degrees.	51.35 degrees.	
1855	February 7,	8 degrees.	June 29,	96½ degrees.	50.68 degrees.	
1856	January 9,	7¼ degrees.	July 27,	97 degrees.	48.95 degrees.	
1857	January 24,	12 degrees.	August 14,	89 degrees.	49.95 degrees.	
1858	February 24,	6¼ degrees.	July 11,	91½ degrees.	50.52 degrees.	—50.29 degrees.
1859	January 11,	12½ degrees.	July 13,	91½ degrees.	50.11 degrees.	
1860	February 2,	4 degrees.	June 29,	90 degrees.	50.00 degrees.	
1861	February 8,	7½ degrees.	July 9,	91½ degrees.	50.79 degrees.	
1862	December 21,	5 degrees.	August 9,	90¼ degrees.	50.68 degrees.	
1863	February 5,	3 degrees.	August 3,	90¾ degrees.	50.30 degrees.	—50.37 degrees.
1864	February 18,	2 degrees.	June 26,	94½ degrees.	51.04 degrees.	
1865	February 12,	1 degree.	July 7,	91½ degrees.	51.76 degrees.	
1866	January 8,	12¾ degrees.	July 17,	98½ degrees.	50.65 degrees.	
1867	January 20,	½ degree.	July 4,	88 degrees.	49.67 degrees.	
1868	February 4th,	4½ degrees.	July 5,	92 degrees.	48.62 degrees.	—50.35 degrees.
1869	March 1,	6 degrees.	July 16,	91¾ degrees.	50.40 degrees.	
1870	December 30,	5¾ degrees.	June 28,	92½ degrees.	52.67 degrees.	
1871	December 21,	1½ degrees.	May 30,	87¾ degrees.	50.46 degrees.	
1872	December 25,	2 degrees.	July 2,	94 degrees.	50.44 degrees.	
1873	January 12,	12 degrees.	July 3,	91½ degrees.	49.34 degrees.	—50.66 degrees.
1874	February 2,	3¼ degrees.	June 29,	91 degrees.	50.41 degrees.	
1875	January 19,	3 degrees.	June 25,	92 degrees.	48.20 degrees.	
1876	December 10,	4 degrees.	July 9,	98 degrees.	51.23 degrees.	
1877	January 6,	7½ degrees.	July 26,	99 degrees.	53.21 degrees.	
1878	February 4,	8 degrees.	July 3,	98¼ degrees.	53.63 degrees.	—51.34 degrees.
1879	January 3,	2 degrees.	July 16,	99¼ degrees.	51.75 degrees.	
1880	December 30,	6½ degrees.	May 25,	96 degrees.	52.92 degrees.	
Mean of the 37 years					50.92 degrees.	

From the foregoing table, the following facts are ascertained:

1st. That the lowest temperature has been experienced in February, thirteen times occurring, on nine of them between the 2d and 10th; in January, fourteen times, occurring on nine of them between the 3d and 12th; in December, eight times, occurring only once before the 20th, and in March twice, on the *1st* and 4th.

2d. That the warmest weather is most likely to occur in July, *having* been experienced in that month twenty-one times, on

thirteen of them prior to the 15th; the next in number was June, ten times; then August, four times, and May twice, on 25th and 30th.

3d. That the extremes of temperature during the thirty-seven years was 112½ degrees; from 12¾ degrees below zero in January, 1866, and 99¾ degrees above in 1849.

4th. That the mean temperature of the years for the whole period was 50.92°; the coldest year being 1875, having a mean temperature of 48.20°, the warmest 1878, having a mean temperature of 53.63°.

5th. That such is the natural tendency to equalization in the course of years, that while the several years have differed nearly five and a half degrees (5.43°), yet between any series of five years, the greatest difference has been less than a degree and a half (1.42).

Highest and Lowest and Mean Temperature of the Several Months.

MONTHS.	HIGHEST TEMP.	LOWEST TEMP.	MEAN OF ALL.
January	1876—65 degrees.	1866—12¾ degrees.	37 years, 29.11 degrees.
February	1874—68½ degrees.	1855—8 degrees.	37 years, 33.17 degrees.
March	1851—77¼ degrees.	1868—2 degrees.	37 years, 37.79 degrees.
April	1846—85½ degrees.	1857—17 degrees.	37 years, 48.71 degrees.
May	1880—96 degrees.	1861—31 degrees.	38 years, 59.19 degrees.
June	1853—97 degrees.	1843—38¼ degrees.	38 years, 68.50 degrees.
July	1849—99¾ degrees.	1845—46¼ degrees.	38 years, 73.81 degrees.
August	1854—99 degrees.	1854—46¾ degrees.	38 years, 71.55 degrees.
September	1854—93¾ degrees.	1848—34½ degrees.	38 years, 64.11 degrees.
October	1861—83 degrees.	1845—22¼ degrees.	38 years, 52.90 degrees.
November	1847—73¾ degrees.	1875—8 degrees.	38 years, 42.38 degrees.
December	1848—68½ degrees.	1852—7½ degrees.	38 years, 32.01 degrees.
Mean			51.11 degrees

Temperature of the Seasons.

SEASONS.	WARMEST.	COOLEST.	MEAN.
Spring	1880—52.34 degrees.	1875—45.13 degrees.	37 years, 48.56 degrees.
Summer	1877—75.34 degrees.	1859—68.12 degrees.	38 years, 71.40 degrees.
Autumn	1850—56.32 degrees.	1875—50.77 degrees.	38 years, 53.16 degrees.
Winter	1879-80—35.91 degrees.	1867-8—24.89 degrees.	37 years, 30.59 degrees.
Mean			50.93 degrees.

The proportionate amount of fair weather during the several years, and the number of days on which rain fell in mensurable quantities, and snow irrespective of quantity in each year:

YEARS.	FAIR. Equal to Days.	Mean of each 5 years.	RAIN. In Days.	Mean of each 5 years.	SNOW. In Days.	Mean of each 5 years.
1844	222		101		23	
1845	238		88		24	
1846	209		98		23	
1847	219		91		31	
1848	233	224	91	94	23	25
1849	214		95		22	
1850	224		97		28	
1851	232		91		18	
1852	233		90		28	
1853	236	227	98	94	21	23
1854	230		79		34	
1855	220		94		22	
1856	253		79		23	
1857	219		101		32	
1858	235	231	98	90	19	26
1859	220		90		28	
1860	227		79		28	
1861	236		86		34	
1862	218		99		29	
1863	213	223	113	93	27	29
1864	239		82		28	
1865	228		85		26	
1866	228		97		24	
1867	213		101		37	
1868	204	222	101	98	36	30
1869	228		112		38	
1870	230		88		27	
1871	227		98		27	
1872	243		86		31	
1873	232	232	97	96	35	32
1874	239		92		28	
1875	219		102		44	
1876	216		96		31	
1877	228		98		13	
1878	219	224	110	100	18	27
1879	204		112		44	
1880	218		116		28	
Means	226	....	97	....	29	....

From the foregoing table it is seen that the amount of fair weather in any one year is, on an average, equal to 226 days. That the average number on which rain falls in quantities susceptible of measurement is 97. That snow is observed on an average 29 days in each year, and that on taking the average of each five years it will be found that the quantities assimilate in a remarkable degree.

Table of Rain-fall at Newark for Thirty-eight Years.

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Average of each 5 years.
1843	....	....	....	....	0.850	1.590	2.285	*22.485	3.610	5.905	3.920	4.145	....	....
1844	4.985	1.640	4.785	0.390	3.550	2.560	5.820	2.080	2.970	5.515	2.040	3.875	40.210	....
1845	3.370	4.210	3.765	1.275	2.155	3.400	2.175	4.800	2.455	2.255	2.875	3.735	36.470	....
1846	5.125	4.160	3.415	3.265	8.745	2.175	4.730	4.105	0.550	2.815	8.745	3.745	51.575	....
1847	4.655	6.075	4.145	0.850	3.155	6.250	3.305	2.890	11.300	3.460	2.840	5.910	54.835	....
1848	1.825	1.815	2.395	1.335	5.985	6.005	2.065	0.955	2.195	4.965	2.720	4.520	36.780	43.974
1849	0.640	2.690	4.855	0.910	4.235	1.090	2.365	8.065	1.600	6.930	2.180	4.470	40.050	....
1850	5.010	3.055	4.175	3.030	7.435	3.535	7.420	4.725	4.405	1.725	1.520	5.110	51.145	....
1851	2.010	4.500	3.967	6.090	3.930	1.105	6.435	1.520	0.625	3.660	4.610	1.930	40.382	....
1852	2.920	2.205	4.805	5.215	2.675	1.720	2.535	4.165	1.740	2.170	5.845	7.545	43.540	....
1853	3.090	5.220	3.145	3.015	4.675	3.655	3.250	11.225	5.030	5.080	3.670	1.285	52.340	45.491
1854	1.790	5.020	0.980	11.365	4.170	2.100	3.580	1.125	3.960	2.440	4.310	2.635	43.475	....
1855	4.030	3.466	1.875	2.470	2.365	4.525	4.470	4.160	2.250	5.260	2.890	6.500	44.261	....
1856	3.370	1.250	2.000	2.570	4.315	3.120	1.410	5.700	2.665	1.400	2.790	3.485	34.075	....
1857	3.830	1.500	1.990	7.155	6.030	5.345	5.080	4.015	3.810	3.955	0.870	5.785	49.365	....
1858	3.405	2.495	1.010	8.852	4.995	4.650	2.995	4.210	1.410	3.010	4.785	4.260	41.077	42.451
1859	6.055	3.800	6.885	5.305	2.250	3.945	4.025	6.265	6.985	2.550	3.785	5.200	57.050	....
1860	2.320	2.710	1.225	2.510	5.000	1.815	2.720	6.235	5.650	2.835	6.715	3.420	43.155	....
1861	4.465	1.885	4.915	4.920	5.190	2.600	1.120	3.970	3.260	2.865	6.425	1.990	43.605	....
1862	5.415	3.695	3.995	3.215	3.045	6.605	3.020	3.005	2.125	4.265	4.455	1.850	44.690	....
1863	4.270	4.250	5.250	5.835	4.490	1.045	5.955	4.975	1.300	3.445	2.610	4.575	48.000	47.300
1864	1.730	0.825	3.145	3.670	5.280	1.855	2.675	3.210	4.680	2.675	3.950	4.760	38.455	....
1865	4.090	4.570	4.890	3.840	5.730	3.485	6.735	3.985	3.210	4.685	3.300	4.885	52.355	....
1866	1.740	5.070	1.820	2.820	4.400	2.505	1.840	5.345	5.470	3.970	2.090	2.910	39.980	....
1867	1.610	5.640	4.395	2.575	6.550	9.745	3.755	10.615	1.235	4.620	1.945	2.045	54.730	....
1868	3.275	1.620	2.170	5.255	6.925	5.895	8.535	4.755	8.955	1.250	4.375	3.845	56.855	48.475
1869	3.420	5.055	4.670	1.150	4.670	5.845	3.690	1.555	2.540	6.820	3.065	5.435	47.935	....
1870	4.725	4.265	4.555	7.000	1.995	3.125	6.965	3.095	2.795	4.750	2.460	2.185	47.915	....
1871	3.035	3.045	4.990	3.685	3.950	7.105	4.140	5.310	1.990	6.026	3.990	2.175	49.441	....
1872	1.845	1.775	3.880	3.745	3.075	4.270	8.940	6.625	3.240	3.110	4.175	3.785	48.465	....
1873	5.820	3.885	2.760	5.835	3.755	1.715	6.615	7.765	3.550	3.740	4.670	2.470	52.580	49.267
1874	5.670	3.168	2.135	8.715	2.755	3.580	4.230	2.785	9.050	2.435	2.860	2.810	50.193	....
1875	3.310	2.400	3.820	3.185	1.595	2.335	5.985	10.215	1.930	2.870	4.360	2.610	44.565	....
1876	1.200	5.355	10.000	3.305	3.045	1.585	3.060	2.450	7.505	1.260	4.040	2.515	45.320	....
1877	3.060	1.650	6.075	3.125	1.010	4.170	5.980	7.730	1.470	7.735	6.915	0.920	49.840	....
1878	6.525	4.960	3.635	1.730	4.205	2.445	4.330	8.060	2.535	2.830	4.570	7.469	53.294	48.642
1879	2.890	2.530	3.745	4.960	2.175	3.038	5.050	9.120	3.950	0.320	1.940	5.330	44.648	....
1880	2.590	2.830	4.900	3.305	0.760	1.185	7.460	4.680	2.480	2.100	2.365	2.685	37.340	....
Means	37 years 3.489	37 years 3.358	37 years 3.815	37 years 3.830	38 years 3.979	38 years 3.493	38 years 4.388	38 years 5.472	38 years 3.586	38 years 3.624	38 years 3.729	38 years 3.787	37 years 46.216	....
Greatest	6.525	6.075	10.000	11.365	8.745	9.745	8.940	22.485	11.300	7.735	8.745	7.545	57.050	....
Least	0.640	0.825	0.980	0.390	0.760	1.045	1.120	0.955	0.550	0.320	0.870	0.920	34.075	....

*Very remarkable—perhaps unprecedented.

Seasons.

	Spring Months.	Summer Months.	Autumn Months.	Winter Months.
Greatest quantity in any one year	1854, 16.515	1843, 26.360	1847, 17.600	1852-3, 15.855
Least quantity in any one year	1855, 6.710	1854, 6.805	1879, 6.050	1871-2, 5,795
Mean quantity	37 yrs, 11.709	38 yrs, 13.353	38 yrs, 10.939	37 yrs, 10.676

From the foregoing table it will be seen that the yearly average of water deposited in rain and melted snow is 46.216 inches, the extremes being 57.050 inches as in 1859, and 34.075 inches as in 1856. It is also seen that while two years in conjunction may differ in quantity 18.055 inches, as in 1847 and

1848, yet the greatest difference in the average of any five years was only 4.849 inches as in 1854–58 and 1859–63. One practical result derived from this table is, that in every square foot of surface in Newark, there falls on an average twenty-eight and eight-tenths gallons of water in the course of a year.

Depth of Snow in each Winter.

	Feet.	Inches.		Feet.	Inches.		Feet.	Inches.
1843-4	2	7	1856-7	4	4	1869-70	1	6
1844-5	3	3	1857-8	2	4	1870-1	3	1
1845-6	4	4	1858-9	3	11	1871-2	1	4
1846-7	4	...	1859-60	4	3	1872-3	5	3
1847-8	1	10	1860-1	4	...	1873-4	3	...
1848-9	3	9	1861-2	4	4	1874-5	3	7
1849-50	2	7	1862-3	4	2	1875-6	1	...
1850-1	2	1	1863-4	1	10	1876-7	2	11
1851-2	5	3	1864-5	4	...	1877-8	1	2
1852-3	2	1	1865-6	2	11	1878-9	2	11
1853-4	5	11	1866-7	5	2	1879-80	7	...
1854-5	3	9	1867-8	6	3			
1855-6	5	5	1868-9	1	10			
Greatest Fall 1867-8							6 ft.	3 in.
Least Fall 1875-6							1 ft.	... in.
Mean							3 ft.	6 in

METEOROLOGICAL SUMMARY AT PATERSON FOR THE YEAR 1880,

BY J. S. HILTON, C. E., CITY SURVEYOR.

The total rain-fall for the year is largely in excess of the mean yearly fall recorded for a period covering nearly half a century. "Draper's" table of rain-falls, running back to 1834, gives 46.75 inches as the mean yearly fall for that series of years. Last year's fall amounts to 57.77 inches, an excess of 11.02 inches over the mean fall of 46 years. Of this total amount, 3.69 inches is due to melted snow, from an aggregate snow-fall of 44.75 inches in depth during the year.

Taking the amount of rain belonging to each season of the year, and comparing it with the mean fall for such seasons, we are enabled to compile the following table:

SEASONS.	Rain-fall for 1880.	Mean Fall.
Winter	13.79 inches.	10.47 inches.
Spring	8.06 "	12.44 "
Summer	22.34 "	12.45 "
Autumn	13.58 "	11.38 "

Here we find all the seasons in excess this year except spring, which fell short 4.38 inches, or about 33 per cent. of the mean. It is apparently rather an anomalous condition of things, to find a year with an aggregate rain-fall largely in excess of the mean fall of half a century, bringing with it a drought so widespread and severe as that of 1880. But in looking over the record an explanation is easily found. Taking the months of May and June, which show the heaviest mean rain-falls, with the exception of August, we find the year 1880 recording for them both but 3.75 inches against a mean fall of 8.60 inches, a deficiency of 4.78 inches, or nearly 60 per cent. This is the record for Paterson. At Newark and New York, the deficiency is still greater, the former place recording a falling off of 6.77 inches and the latter of 6.52 inches for the same months. We find further, that during May, 1880, there was but one day, and in June only three days, on which rain, otherwise than a mere sprinkling, fell.

This gives a period of 61 days, with only four days on which rain of any account fell. To this most unusual scarcity of rain, at the very period in which nature usually provides most bountifully for the saturation of the water-sheds and replenishing of the water-courses, was added a very high temperature for both months, and the prevalence of drying winds from the southwest, west and northwest. In these facts we can readily find sufficient causes for the severe drought, from which we are even yet not free, notwithstanding the large aggregate amount of rain for the year. During the year the greatest amount of snow fell in the months of March and December, it being 14 inches in each month. The least snow was in January, 3 inches. The heaviest monthly rain fell in July, amounting to 12.06; the least in May, 0.85 inches. The longest period without rain was 22 days, from the 31st of April to 21st of May (inclusive.) During the year rain fell in measurable quantities on 115 days. During 1879

rain fell on 114 days. The mean temperature for the year was 55°, 5° above the average. The temperature of the winter months was 37°, nearly 7° above the average. The spring months were 6° above the average, and the summer and autumn months, 6° and 1° respectively above the average. This record shows an unusually high temperature for the past year. The river was unusually low during the whole year. The highest water recorded for the year was on the 14th of February, it being then 3 feet 10 inches above extreme low water. On the 15th of March it was only 1½ feet above extreme low water level, and on April 28th it was barely 10 inches above extreme low water at the Arch street bridge. In April, 1879, it was 5 feet 10 inches above low water at the same point. From May to the end of the year the highest level reached was only 1 foot 8 inches above extreme low water,—and the rise was only temporary, the water rapidly falling after each rise, and from May to the end of the year it approximated but a few inches above extreme low water, the rains having little effect on it. The remarkably heavy rain of July, amounting to 12.06 inches, raised it but one foot above extreme low water. There is no record to show that the Passaic river has ever been at so low a stage of water continuously as during the year 1880. Since May there has been no time during any month when the average level has been more than one foot above extreme low water, below the Falls, and that only for a few days.

In fact, the drought, in duration, may be stated as one lasting eight months, and a drought of that extent may be safely recorded as having never been equalled, at least within the memory of the "oldest inhabitant." During 1878 and 1879, the low water in the river lasted only twenty-five days in the former, and forty-four days in the latter year. Against these periods, a drought of two hundred and forty days for 1880 is remarkable, and the drought of 1880 bids fairly now to extend into 1881. The rain fall of December, 1880, is far below the record for the last two years, and is 1.50 inches below the mean fall for the month. The stage of the river at present is but a few inches above extreme low water.

In 1878, the river in December was ten feet above low water, and in 1879 it was nearly three feet above. Never since the incorporation of the Passaic Water Company has its capacity

been so tried as during this year. Since May, their turbine has been used only a few days, and the steam pumps have been working continually night and day. During October, the water in the river and reservoirs was so low that, by agreement, the manufacturing establishments along the race-ways stopped work for one day (the 12th) to allow the river to fill up, and give the Passaic Water Company a chance to fill up their reservoirs. Thousands of dollars have been lost to these establishments during the year, in the enforced short time and stoppages, caused by the scarcity of water.

City Surveyor's Office, City Hall, January 5, 1881.

Table of Temperature and Rainfall at Freehold, N. J., from July 1st, 1879 to July 1st, 1880.

MONTHS.	Minimum Temperature.		Maximum Temperature.		Monthly Mean Temperature.	Rain or snow fell on days.	Total Rain-fall or melted snow.	Mean do. of five years.	Mean relative humidity.	Prevailing winds.	Thunder and lightning on days.
	Date.	Degree.	Date.	Degree.			Inches.	Inches.	Per c't.		
July	1 and 6	56.	16	97.	73.76	10	5.45	4.91	78.3	W.	10
August	10	51.	3	92.5	70.853	10	9.58	6.59	83.4	W.	5
September	26	37.	1	85.	61.44	8	1.86	2.92	80.2	W.	6
October	26	24.5	3	83.	58.49	9	0.68	2.85	79.6	W.	2
November	21	15.5	12	72.	41.498	7	1.71	4.40	74.2	W.	1
December	27	8.	4	60.	36.71	12	6.77	3.82	80.3	N.W.	......
1880. January	14	11.	28	58.5	38.183	11	2.06	3.03	81.4	W.	1
February	2	9.	27	67.	34.757	11	2.69	2.67	76.1	W.	......
March	25	16.	5	69.	36.863	16	5.71	5.95	74.2	N.W.	......
April	12	23.	15	82.	49.707	12	2.91	2.90	67.5	N.W.	7
May	1	32.	27	94.5	67.15	6	0.82	2.32	69.2	W.	5
June	3	49.	24	94.2	71.966	7	1.58	2.99	71.6	W.	8
Totals	....	332.0	....	954.7	641.377	119	41.82	....	916.0	W.	45
Means	....	29.3	....	79.5	53.448	9.9	3.48	....	78.3	W.	3.7

Observations taken by Frank Osborn, Middletown, N. J., from July 1st, 1879 to July 1st, 1880, inclusive—Maximum and Minimum Temperature.

DAY OF MONTH.	1879.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86	61	85	68	87	62	79	56	54	27	42	18
2	85	59	89	69	88	63	92	61	50	27	45	21
3	87	57	92	71	85	65	81	60	54	32	60	32
4	92	69	92	72	72	67	90	54	41	22	62	38
5	93	62	84	66	84	62	81	52	47	19	73	32
6	69	56	87	68	81	59	81	55	50	18	45	36
7	73	55	88	71	78	60	71	58	55	31	58	45
8	77	56	74	69	83	65	75	57	58	32	60	40
9	82	66	81	61	79	54	76	57	59	38	62	36
10	86	66	68	53	75	51	87	63	74	58	47	36
11	89	67	77	53	75	51	75	62	76	43	60	45
12	88	67	80	60	73	55	66	59	53	43	63	36
13	77	62	84	60	75	53	75	60	78	51	50	22
14	81	61	84	61	73	51	79	49	72	49	40	24
15	87	68	85	64	72	52	78	49	65	50	46	35
16	96	69	72	64	74	49	83	58	75	50	52	25
17	96	69	74	64	73	49	89	62	66	38	38	25
18	84	59	78	66	78	50	82	61	68	38	52	18
19	78	58	69	63	76	54	81	55	48	30	44	18
20	77	58	81	62	71	52	71	39	48	32	35	28
21	76	57	81	60	72	54	67	39	36	18	36	23
22	79	60	82	60	62	56	66	45	32	18	38	15
23	91	65	89	66	59	50	67	56	39	14	40	30
24	87	67	80	62	73	49	75	40	54	24	42	30
25	78	66	75	61	75	45	53	27	52	24	45	81
26	73	65	68	60	65	42	48	27	53	28	37	8
27	73	65	66	57	68	42	59	36	56	31	33	6
28	86	70	71	55	68	48	55	37	52	32	30	9
29	83	69	78	57	72	50	69	42	61	49	45	29
30	84	69	84	59	69	54	64	45	55	23	48	35
31	79	69	85	59	....	....	54	27	....	....	57	19

DAY OF MONTH.	1880.											
	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	33	19	50	24	70	36	62	29	63	31	78	60
2	35	28	40	7	54	25	69	38	66	33	90	49
3	49	26	32	31	52	25	60	39	72	52	60	48
4	48	30	37	22	54	35	70	51	82	54	71	52
5	56	32	38	10	71	48	66	50	85	52	78	56
6	58	36	32	12	70	39	70	41	75	52	77	58
7	51	38	46	24	58	34	59	32	85	51	83	64
8	50	31	44	12	42	33	48	23	65	47	88	63
9	50	31	41	15	53	24	49	27	72	51	68	55
10	51	32	40	8	32	24	56	31	98	58	76	53
11	62	31	34	12	47	22	69	35	92	62	77	58
12	55	38	42	35	27	20	49	22	86	56	81	61
13	55	22	50	41	36	24	47	22	79	49	94	69
14	35	12	68	49	35	27	62	36	65	46	88	66
15	49	12	56	31	*	*	83	52	59	39	78	62
16	50	28	35	27	40	30	86	53	70	45	67	57
17	55	25	40	27	37	30	60	44	80	62	73	56
18	46	26	58	27	47	20	60	36	88	60	79	59
19	50	33	62	31	46	26	71	38	70	52	82	60
20	55	34	45	16	41	30	60	45	60	56	89	65
21	56	30	45	16	51	27	65	40	85	55	88	65
22	52	30	*	*	50	27	71	40	87	60	89	65
23	54	32	*	*	51	27	74	32	80	62	85	61
24	50	28	51	20	60	32	57	39	80	64	87	65
25	50	27	48	21	41	13	45	38	89	65	97	73
26	42	30	49	31	44	18	50	42	99	68	94	71
27	55	30	59	42	52	24	65	49	97	71	93	70
28	57	40	*	*	48	35	65	40	98	67	90	71
29	69	30	75	42	38	28	69	42	92	58	93	70
30	50	22	....	....	41	28	62	44	75	58	93	72
31	52	41	....	....	*	*	....	....	76	62	....	....

*No observations taken.

Maximum, Minimum and Mean Temperatures. Station, Barnegat, New Jersey.

DAY OF MONTH.	1878.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	82	61	74	64	82	73	69	56	47	37	48	36
2	82	66	85	65	84	72	75	59	56	35	57	45
3	83	67	84	67	78	70	70	59	49	38	49	37
4	88	67	82	67	74	70	71	57	50	31	53	40
5	82	66	82	69	76	66	64	53	42	28	41	29
6	77	64	79	65	73	66	64	51	56	31	43	30
7	80	66	82	65	73	66	63	46	40	34	41	27
8	81	69	86	67	63	64	66	52	43	31	38	25
9	75	64	80	68	71	66	73	59	42	29	51	37
10	73	62	81	67	73	68	67	55	53	35	55	41
11	74	64	78	68	74	68	60	55	57	35	45	33
12	70	64	77	67	76	68	58	51	62	43	40	30
13	71	64	78	65	77	67	67	47	58	37	39	27
14	75	62	76	68	73	58	68	46	46	33	42	30
15	84	63	76	70	72	56	70	57	45	30	45	33
16	72	66	80	69	69	60	72	58	53	44	34	26
17	79	65	77	70	71	55	70	62	54	50	33	22
18	94	68	83	71	80	59	70	46	54	43	37	26
19	89	68	78	69	75	63	56	44	52	43	31	21
20	79	72	79	66	82	67	62	39	49	41	32	21
21	84	72	77	65	83	69	67	43	55	40	49	23
22	79	66	72	65	70	56	64	45	54	46	47	30
23	82	63	70	65	65	56	66	56	47	38	31	19
24	78	64	73	60	74	63	61	47	56	35	29	15
25	88	66	78	65	72	63	57	43	57	43	22	13
26	78	65	72	60	77	60	61	44	54	37	31	12
27	84	65	77	59	61	49	63	54	57	37	28	20
28	77	65	75	63	60	54	58	41	57	38	31	18
29	80	63	74	63	67	54	52	38	48	35	30	13
30	72	62	78	64	68	62	63	45	48	30	35	21
31	67	62	77	64	....	....	52	40	....	....	34	19
Range	33°		27°		35°		37°		34°		45°	
Monthly Mean	71°.2		71°.1		67°.6		57°.2		43°.8		32°.9	

DAY OF MONTH.	1879.											
	January.		February.		March.		April.		May.		June.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	36	23	33	20	34	24	55	33	61	43	75	57
2	37	8	26	16	36	26	49	34	59	39	73	55
3	13	1	36	25	36	28	50	28	62	39	66	57
4	21	6	38	23	41	32	39	24	54	46	72	56
5	21	11	37	21	50	36	38	25	61	48	76	58
6	28	11	35	28	41	32	47	23	67	49	78	58
7	31	14	37	27	43	30	53	37	57	45	65	48
8	41	22	32	23	33	26	44	32	57	45	74	52
9	41	27	42	18	42	31	60	32	56	46	74	51
10	28	19	33	19	51	36	49	42	57	48	78	60
11	33	17	43	32	65	39	43	37	56	47	79	57
12	35	26	47	34	48	32	49	31	59	48	70	57
13	37	27	35	25	47	31	57	32	66	52	72	59
14	38	28	26	16	51	39	49	41	68	54	71	56
15	29	22	22	8	47	31	48	40	68	53	74	55
16	35	20	33	10	42	30	51	42	68	54	84	56
17	33	18	33	29	54	32	43	39	67	56	73	56
18	38	27	34	26	33	26	42	38	72	56	66	52
19	30	22	29	24	38	23	41	36	65	56	67	55
20	22	12	32	25	51	21	59	34	70	57	67	57
21	35	9	25	16	57	38	56	33	67	57	76	55
22	42	29	32	10	44	34	59	43	63	53	70	58
23	44	28	37	25	44	33	69	45	59	50	75	58
24	38	22	34	23	41	28	55	42	67	41	75	60
25	52	32	36	26	48	33	53	45	71	53	68	59
26	34	17	46	32	38	26	64	43	65	54	74	61
27	37	18	36	20	48	36	48	41	63	48	84	59
28	61	25	26	14	49	38	57	43	66	58	78	56
29	42	29	....	....	42	36	54	49	72	55	74	55
30	36	21	....	....	55	38	65	47	72	58	72	60
31	41	24	....	....	41	33	....	....	70	58	....	....
Range	62°		39°		44°		46°		33°		30°	
Monthly Mean	28°.2		29°.1		38°.7		44°.2		57°.6		64°.9	

METEOROLOGICAL SUMMARY FOR 1880.

Station, Bayard Avenue, Princeton, N. J. Latitude 40° 21′ *N.; Longitude,* 2° 20′ *E. Height of Barometer Cistern above Sea Level,* 225 *Feet.*

OBSERVER, PROF. C. G. ROCKWOOD, JR.

	Barometer. (Reduced to 32 degrees.)			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain, (inches)*	Snow.	Days when precipitation equalled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
January	30.424	29.307	29.940	60.5	2.5	37.71	‡	N. E.	2.82	4.0	8	9
February	30.359	28.848	29.856	67.5	8.3	35.40	69.0	N. W.	2.43	6.5	10	7
March	30.225	29.146	29.813	71.5	16.4	36.73	68.9	N. W.	5.20	9.5	16	13
April	30.104	29.319	29.767	79.5	24.7	49.97	62.6	N. W.	4.12	....	11	7
May	30.052	29.499	29.812	97.3	32.7	66.98	62.3	S. W.	0.62	....	4	6
June	30.032	29.358	29.746	97.3	48.2	71.82	68.3	S. W.	1.41	....	8	3
July	29.923	29.431	29.739	93.0	55.0	72.81	72.4	W.	11.13	....	12	7
August	30.183	29.467	29.814	89.3	50.9	70.74	77.5	S. E.	3.21	....	7	10
September	30.116	29.436	29.802	91.0	43.9	65.27	71.6	S. W.	2.25	....	8	7
October	30.171	29.232	29.865	80.0	29.3	52.22	71.0	N.W.&S.W.	2.56	trace	10	7
November	30.489	29.301	29.996	68.3	11.3	37.87	73.24	N. W.	2.66	3.0	8	11
December	30.224	29.342	29.782	46.7	11.0	26.09	74.5	W.	3.57	17.75	10	11
For the Year	30.489	28.848	29.829	97.3	11.0	51.97	....	....	41.98	40.7	112	98

*Including melted snow. ‡Hygrometer not mounted.

Summary of Weather Observations at Vineland, N. J., for 1880.

MONTHS.	TEMPERATURE. Max.	TEMPERATURE. Min.	TEMPERATURE. Mean.	MOISTURE. Hygrom.	MOISTURE. Rainy days.	MOISTURE. Rain in inches.	BAROMETER. Max.	BAROMETER. Min.	BAROMETER. Mean.	BAROMETER. Range.	FROST. Any frost.	FROST. All frost.	Thunder days.	WINDS. N.	WINDS. N.E.	WINDS. E.	WINDS. S.E.	WINDS. S.	WINDS. S. W.	WINDS. W.	WINDS. N. W.
January	61	10	41.28	71	12	2.820	30.450	29.525	30.041	.925	12	......	......	10	8	2	15	1	26	2	29
February	69	12	39.68	60	7	2.260	30.392	29.014	29.923	1.378	17	3	......	....	3	....	14	7	29	9	25
March	74	20	40.91	69	13	6.350	30.306	29.144	29.864	1 162	12	......	1	7	17	2	5	4	16	8	34
April	82	22	53.06	65	10	2.610	30.164	29.414	29.808	.750	5	......	2	1	5	1	13	9	24	2	35
May	96	34	69.20	63	5	200	30.088	29.608	29.871	.480	......	......	1	5	3	1	20	12	22	6	24
June	97	52	74.77	69	5	3.050	30.112	29.527	29.842	.585	......	......	7	12	12	....	10	7	27	18	14
July	98	56	76.45	73½	8	8.636	30.024	29.560	29.838	.464	......	......	7	9	6	....	12	3	37	1	25
August	90	50	73.08	77	8	6.635	30.230	29.592	29.909	.638	......	......	7	4	20	1	12	5	41	1	9
September	92	44	66.83	80	5	2.941	30.160	29.590	29.899	.570	......	......	......	4	11	2	12	5	29	8	19
October	92	28	63.84	74	7	1.140	30.589	29.384	29.996	1.205	6	......	......	9	16	4	5	10	24	7	18
November	67	9	38.22	63	9	4.440	30.594	29.500	30.076	1.094	21	7	......	6	10	....	13	4	22	16	19
December	50	10	26.23	56	10	7.525	30.830	29.534	29.910	.796	27	16	1	8	10	1	3	3	18	13	37
Means	....	....	55.23	......	99	50.397	....	....	29.915	....	......	......	......	....	....	....	....	....	....	....	....
Yearly range of barometer	....	....	....	......	......	....	....	....	....	1.580	......	......	......	....	....	....	....	....	....	....	....
Yearly range of temperature	....	....	....	......	......	....	108°	....	....	....	......	......	......	....	....	....	....	....	....	....	....
Total	....	....	....	......	......	....	....	....	....	....	100	26	26	75	121	14	134	70	315	83	288

GENERAL FACTS.

Under the caption "Frost," where it says "any frost," i. e. frost any part of the day, this foots up 100 frosty days for the year; while under "all frost," it means the frost was continuous through the day, and under this there were 26 days in the year.

The average number of "any frost," for 15 years, is 92 days in a year, and of "all frost," for same time, is 27 days; highest number "any frost" is 113, lowest 75, in 1878; highest "all frost," 45, in 1868; lowest "all frost," 16, in 1869 and 1870.

Snow in general here.		Any frost.	All frost.	Winds for fifteen years. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Number of observations.
1866	23½ inches	92	22	26	81	10	106	4	546	33	289	1,095
1867	49¾ "	91	38	25	174	31	170	15	370	36	274	1,095
1868	40 "	113	45	20	191	28	152	9	381	24	293	1,098
1869	13½ "	101	16	3	129	23	87	10	493	28	322	1,095
1870	15 "	76	16	24	158	23	156	19	378	67	278	1,095
1871	36¾ "	78	30	14	157	14	160	22	347	85	296	1,095
1872	49½ "	113	35	21	116	16	145	22	416	125	237	1,098
1873	15½ "	92	19	16	182	39	155	26	329	120	238	1,095
1874	17 "	92	19	28	184	21	115	38	378	96	235	1,095
1875	50¼ "	101	39	29	186	19	109	27	401	76	248	1,095
1876	25¼ "	91	30	45	136	19	166	53	413	77	249	1,098
1877	36¼ "	79	18	57	178	20	86	77	343	59	275	1,095
1878	7¼ "	75	24	68	152	25	140	59	310	53	293	1,095
1879	11 "	92	21	78	101	23	93	80	369	75	276	1,095
1880	54¼ "	100	26	75	121	14	134	65	315	83	288	1,098
Total	444 9-20 "	....	....	524	2,246	325	1,916	526	5,789	1,037	4,061	16,444
Average (nearly)	30 "	92 2-5	26 8-15	35	150	22	128	35	386	69	272	....

Wind Before, During and After Rain in 1880.

Wind.	Before.	During.	After.
N.	5	0	5
N.E.	7	25	6
E.	1	6	0
S.E.	10	23	4
S.	9	15	6
S.W.	28	26	16
W.	0	2	8
N.W.	7	13	20

OUR MILK SUPPLY.

WILLIAM K. NEWTON, M. D., STATE MILK INSPECTOR.

Milk is the type of food; it is the model alimentary substance. Containing, as it does, the essential varieties of nourishment, it is sufficient for the maintenance of life, and, unaided by other foods, is able to keep the system in a healthful state. It constitutes, almost exclusively, the diet of children at that time of life, when they are the least able to withstand any interference with the purity of their food. In short, it is one of the most important articles of food that enter into daily use. It is absolutely necessary, then, that an article so universally used, and one playing so important a role in every-day life, should be easily obtained in a pure state, unadulterated, and free from the germs of disease. There is, however, no one article of food that is so frequently adulterated or sold in an impure state, as the one now under consideration.

What is to be done, then, to check this trade in impure and diseased milk? The people look to the State for stringent laws against adulteration, and to our health officers for the rigid and impartial enforcement of such laws. Our citizens are deeply interested in the subject; aside from the great loss of money entailed by the sale of watered milk, the health and lives of their children are at stake.

If we look at our vital statistics, it will be noticed that the death-rate during the first five years of life is enormous; the chances of surviving beyond the fifth year are small indeed. In infancy, when the tenure of life is the slightest, when the death-rate is the highest, and the amount of sickness the greatest, then will we find the disastrous results that follow the use of skimmed and watered milk. It is our duty to remove in every way, even

the slightest cause of ill-health or death. The lives of these children are of value to the nation.

It is estimated that a life is worth one thousand dollars to the State and every death, consequently, is so much loss; if we look at the subject in this light, leaving out of consideration the wreck and sorrow in the household, the subject is of vast importance and one demanding the most careful thought. "The child is the promise of all the hereafter. The whole future of the world is wrapped in him. Unless he fulfill this promise and grow to manhood, the family ceases, the State perishes, the human race comes to an end. The family has the intensest interest of affection in his preservation, and all the pride and power of the nation rests on his life." (*Jarvis.*)

The increase in infant mortality is largely caused by artificial feeding and the use of milk devoid of nourishment. The danger is a real one; sickness and death are caused by feeding the children on skimmed and adulterated milk. The sooner the subject is grappled with and the remedy applied the better will it be for our infant population.

Let stringent laws be passed prohibiting the sale of adulterated and impure food and let these laws be enforced. Let our health authorities be impressed with the great responsibility resting on them. Good work will be done when this nefarious traffic in impure milk is broken up and when the dealers in it—who are not inaptly called our modern Herods, the slayers of infants—are brought to justice. This branch of preventive medicine is a vital one, and demands our serious attention.

We may state, in the beginning, that this article is not an exhaustive one. It is written in the interest of public health and aims to teach the people a little about our milk supply, the adulterations used and the dangers that may arise from the use of impure or diseased milk. As far as possible technicality has been avoided, as we do not seek to teach experts; chemical processes have been omitted, as all attempts at entering into competition with special treatises on the subject would do little good. We have refrained, when we could, from burdening the text with foot-notes and references, but have added a somewhat exhaustive bibliography at the end of the paper, which may be consulted by any one wishing further information on the subject.

For convenience, we have divided the subject with various sec-

tions, and will consider it under the following headings: A, the source of our milk supply; B, adulteration; C, detection of adulteration; D, effects of impure milk on the health; E, diseased milk may cause disease in man; F, feeding influences the healthfulness of milk; G, milk as an article of contagion; H, laws bearing on our subject; I, the inspection of milk; J, bibliography.

A.—THE SOURCE OF OUR MILK SUPPLY.

One who has not investigated the subject will be astonished at the immense amount of capital invested in the dairy interest in our State. There are in New Jersey about one hundred and sixty thousand milch cows, representing, in value, five million six hundred and eighty thousand dollars; if to this is added the capital invested in the milk business in its various branches, not far from seven million dollars will be found to be locked up in the different branches of the trade. The daily production of milk is about two hundred and forty thousand gallons; a large quantity of this is shipped to New York City; the Midland Railroad carries, on the average, four hundred and twenty cans a day to New York; the Central Railroad, three hundred and twenty-five cans; the Delaware, Lackawanna and Western Railroad, three hundred and eighty cans. By far the largest amount produced is used in our own State, in the butter and cheese factories and as food.

New Jersey contains but few large cities; there are but seven cities with a population greater than twenty-five thousand. Small towns preponderate. Hence the greater quantity of milk used as food is obtained in the towns in which it is used, very little being transported from the source to the place where it is consumed. Newark, Jersey City and Hoboken are the only large towns that receive much milk by the railroads. Inspection, then, is not easy, and the supply being in the hands of many small dealers is not well under control. The greatest source of impure milk is that produced by cows shut up in the stables in the cities; these animals are poorly housed and fed, and milk thus made cannot be of good quality; this last remark is peculiarly applicable to the cities of Newark, Jersey City, Hoboken and Paterson. Our farmers are, as a rule, honest, and endeavor to supply a pure article; the greatest trouble is with the dealers

in the towns and cities, who are not themselves dairymen, but who buy from producers, and who adulterate to a greater or less degree. Only local inspection can reach them. Many of the cheese factories send skimmed milk to our towns and cities, and the use of this article cannot but be followed by a long train of disease among the children.

B.—ADULTERATION.

The list of substances said to be used for the purpose of adulterating milk, is a long one. Every authority writing on the subject of milk adulteration has, in preparing the work, copied from various books the names of materials at any time used, hence they make now a formidable catalogue. Practically speaking, adulteration, in this country, is limited to the use of water, sodium carbonate or bicarbonate, potassium nitrate, turmeric, annatto, caramel, salt, borax, and possibly magnesium carbonate and glycerine. Fortunately, the adulteration practiced is limited and the substances used are easy of detection.

The substance must needs be such that its introduction into the milk will not be detected by the naked eye, and must neither be precipitate nor float on the surface. At the same time the material added must not coagulate on boiling, nor give taste, odor or color to the milk by which its presence may be easily discerned.

We have, notwithstanding the fact that many of these materials are never or but seldom used in this country, thought it best to mention the substances said to be used, in order to make the subject more complete. The substances thus said to be used in the adulteration of milk are:

Water,	Starch,
Sodium carbonate and	Arrowroot,
Bicarbonate,	Gum Arabic,
Borax,	Dextrine,
Magnesium carbonate,	Gum Tragacanth,
Potassium carbonate,	Chalk,
Sugar,	Gelatin,
Caramel,	Glycerine,
Potassium nitrate,	Emulsion of almonds and
Turmeric,	Hempseed,
Annatto,	Brains,
Flour,	Hempseed.

We will now take each in turn, and state for what purpose it is added.

Water is by far the most common adulterant. It was estimated by Professor C. F. Chandler, that "the average milk sold in New York City, consisted of three-fourths milk, and one-fourth added water. The 120,000,000 quarts of milk sent annually to New York receive an addition of 40,000,000 quarts of water, which sold at ten cents per quart, brings four million dollars per annum, or twelve thousand dollars per day. This fraud, besides being expensive, exerts a most unfavorable influence on the health of young children especially." It is difficult to trace the adulteration with water to its source; milk passes through so many hands before reaching the consumer, that it may have received two or three dilutions before being served on his table. In our tours of inspection in various parts of the State, we found that the farmers, as a rule, were honest in their endeavors to send pure milk to market, but there are many dishonest men among that class. A farmer, for instance, may have a contract to supply a dealer with five cans of milk daily; from some cause the supply falls short ten quarts, and if the producer be dishonest, the deficiency is made up with water. Now the ten quarts in five cans may appear to be a small quantity, and will be difficult of detection; but when this milk reaches the middle-man, and his supply is not sufficient to meet the demand, he dilutes it to bring it up to his quantity, and by the time the consumer gets it, three or four dilutions may have been practiced. The most adulterating is not done by the farmer; the exaggerated examples are to be found in our cities, among the smaller dealers. It is to be hoped that if adulteration is done with water, that it is free from the germs of disease.

Sodium, carbonate and bicarbonate. These substances are added to disguise an excess of acidity, and in some cases, to increase the specific gravity.

Borax is added for the same purpose, and also to retard the separation of cream, and to preserve the milk.

Magnesium and potassium carbonates are added to correct acidity and to cover a blue tinge.

Sugar and caramel are used to give color and to develope the flavor of impoverished milk.

Salt is used as a flavoring agent and to increase the specific gravity of skimmed and watered milk.

Potassium nitrate has been discovered in milk from Orange County, N. Y. It is added to increase the specific gravity and to act as a preservative.

Turmeric and annatto are used to cover a blue color.

Flour, starch, arrowroot, gum-arabic, gum-tragacanth, dextrine, emulsion of almonds and hempseed are said to be added to increase the consistency of milk, but the fraud is so transparent that it is hardly probable that any of these substances can be added successfully.

Chalk. This substance is popularly supposed to be a favorite adulterant. It is hardly probable that it is used; the certainty of its detection is against its use. It is asserted that chalk is used to make milk that has been watered white and to correct acidity.

Gelatine has been added to give consistency.

Glycerine is used to increase specific gravity, to give consistency and taste.

Brains. Every book on food-adulteration mentions the fact that calf-brains have been used to thicken milk. This may have been done at some time, but it is difficult to trace this statement to the originator, and it is hardly probable that any person, however depraved, would use this substance as an adulterant.

C.—DETECTION OF ADULTERATION.

Having mentioned the various adulterants and the purposes for which they are used, we will now consider the methods employed for their detection.

Water. There are three methods for determining the amount of water added to milk: 1, by determining the specific gravity, 2, by chemical analysis, 3, by estimating the percentage of cream. Unless a standard of purity is fixed on beforehand it will be impossible to estimate the quantity of added water. Whether a chemical analysis is made or a hydrometer used it does not alter the case; a standard must be agreed on.

In New York City, the hydrometer is used as an instrument for determining the amount of dilution with water. In Massachusetts, Rhode Island and Maine a chemical examination is required by law when suit is brought against an offender.

1. Specific Gravity Method.—For determining the specific gravity, a hydrometer is ordinarily used, but in cases requiring great accuracy the gravity is arrived at by weighing a known quantity of the milk. The latter plan being employed by chemists. The hydrometer used in testing milk, is called, in this country, a *lactometer*. All tests are made at 60° Fahrenheit.

Much has been written, within the past few years, for and against this instrument; but had the instrument and its use been clearly and honestly defined, there had been no necessity for any discussion. The lactometer is nothing but a hydrometer, and it can do no more than register the specific gravity of milk. It can, within certain bounds, tell the amount of water added, and can, with a certain degree of accuracy, detect skimmed milk.

If we take pure milk, and allow the lactometer to float in it, the instrument will sink to a certain mark in the stem. If we now add water to the milk, the specific gravity is lowered, and consequently, the lactometer will sink lower in the fluid. If we skim the milk, the instrument will float higher in consequence of the increased specific gravity. The lactometer favors the milkman rather than the consumer; the only error it can make would be in a case where the milk had been *adulterated* with cream; then the specific gravity would be lowered and the instrument would register a point equal to watered milk. It is well to bear in mind that the lactometer, to be of any service, must be used by a person who is a competent judge of milk and is thoroughly acquainted with the pure article; such a person would easily distinguish between watered milk and milk rich in cream. A person conversant with milk can tell, with any instrument, whether a milk is rich or poor, and a man is not competent to act as inspector who cannot make these distinctions.

Now, if we use the lactometer as the instrument for the detection of added water, what specific gravity shall be taken as that of pure milk? The New York Board of Health has taken the lowest average. for pure milk, and fixed the standard at the specific gravity of 1.029 at 60° F. We do not propose to lengthen this article unnecessarily by quoting authorities to prove the accuracy of this standard. Suffice it to say, that hundreds of samples of milk, known to be pure, have been examined by the New York authorities, and in no case, where the milk

was from a healthy cow, did the specific gravity fall below that figure. And, in this State, in our capacity of State Milk Inspector, we have inspected hundreds of samples of milk, known to be absolutely pure, and in no instance did we find a single sample to have a specific gravity as low as 1.029. We can state, then, that the New York standard is many degrees too low, and admits of watering from five to ten per cent. If any one wishes to consult authorities, the list of authors appended to this article may be used.

In lawsuits, in New York City, the lactometer has many times been criticised, but as a rule, it has come off victorious as a compent instrument with which to take the specific gravity of milk. Prof. C. F. Chandler, President of the New York Board of Health, has testified in these cases, that the instrument is able to register the specific gravity of milk. Prof. Morton, of Stevens' Institute, said that 1.029 was a correct standard, and that a lactometer of that standard would give the specific gravity. Prof. Barker, of the University of Pennsylvania, testified that the lactometer was a good test for the specific gravity of milk; chemical analysis was the best way to test the *purity of milk.* The evidence all tends to prove the statement, that the lactometer will give correctly the specific gravity of milk; more than this it will not do.

As the lactometer of the New York Board of Health is used extensively in this State, it will be well to describe its construction. The scale of a hydrometer long enough to use in testing milk would be inconveniently long and the figures confusing. To obviate this, Dr. Chandler has made a scale for his instrument which is easy to read, and which gives an idea of the percentage of adulteration with water. A hydrometer stem is taken, and at a point equal to the specific gravity 1.029—which is the standard for pure milk—is marked 100, at the top of the stem, at a point equal to 1.000 (or pure water) the lactometer is marked 0, the intervening space being divided into 100 divisions; below one hundred, 30 degrees are marked off equidistant apart. "The point to which the lactometer sinks in the milk under examination, indicates the percentage of milk in 100 parts. Thus, if the instrument sinks to 80, the milk is 80 per cent. pure, and contains 20 per cent. added water." But this

assumes the original milk to have a specific gravity of only 1.029, which is lower than good milk.

The lactometer errs, therefore, in not showing the dilution of good milk down to our low standard, and consequently in reporting on a portion of dilution. If the lactometer is used in this State to detect adulteration and watering, the standard of purity should be fixed at a higher point than 1.029, or 100 of the New York instrument; for as previously stated the figure allows too wide a margin for watering. We hold to the opinion that in cases of suit, a chemical analysis should supplement the use of the lactometer; for if the specific gravity be raised by the addition of any substance like salt, caramel, etc., that instrument will not detect it. For rapid inspection the lactometer is of great service, and in a short time the inspector can examine many cans, easily selecting the pure from the impure, and in case of suspected adulteration a chemical analysis may follow.

2. *Chemical analysis.* As in the case of estimating the degree of watering by the lactometer, an arbitrary standard of purity must be fixed on before any conclusion can be arrived at by a chemical analysis.

The law of Massachusetts fixes a chemical standard of purity. It reads: "In all cases of prosecution, if the milk shall be shown upon analysis to contain more than 87 per cent. of watery fluids, or to contain less than 13 per cent. of milk solids, it shall be deemed, for the purpose of this act, to be adulterated." Massachusetts, then, has fixed a standard of purity. There is no question to be debated in case of suit as to the inspector being an expert, for he turns the sample over to the State analysist and the latter decides on the character of the milk. This method makes the question an easy one to decide in case of suit, and the discussion as to the accuracy of the lactometer, or any other instrument is avoided. This abitrary standard has been determined on from analysis made by Sharples, Babcock and other chemists. There is here, however, a wide margin allowed for milk of a poor character, and this margin is in favor of the milkman. We give the result of an analysis of pure milk from ordinary cows for the purpose of showing that 13 per cent. of total solids is a fair standard by which to judge the milkman:

Analyst.	Number of Cows.	Total solids.
Sharpless	22	14.49.
Babcock,	8	14.55.
Vaughn,	58	14.08.
Newton,	24	14.26.

If the State of New Jersey demands that a chemical examination be made to determine the degree of adulteration, a course which we favor, it would be well to adopt the standard of Massachusetts; this will allow dairymen to sell milk that will represent a fair degree of purity, and, at the same time, be equitable for both sides.

We do not wish to take the space requisite to discuss, at length, the various chemical manipulations used in milk analysis. The special works on the subject must be consulted. We will describe, however, the method we employ to determine the amount of water and milk solids: The sample to be analyzed is thoroughly mixed; 5 *Grams* of the milk are accurately weighed out in a tarred platinum dish, this is placed on the water bath and allowed to evaporate for three hours; the dish is carefully dried and weighed; the loss in weight will equal the amount of water, and the weight is that of the total solids. This method is more accurate than where the milk is measured with a pipette.

3. *By estimating the per cent. of cream.* This method is very inaccurate; the separation of cream is influenced by the temperature and various other factors. The cream glass used is a graduated tube, the graduators being from 0 to 20, as a rule; the milk is placed on the glass and allowed to stand at a temperature of 55° F., or 60° F., for twenty-four hours, when the per cent. is read off.

A very rapid and easy method—at the same time accurate—for getting at the amount of fat, and hence the degree of dilution with water, is the lactobutyrometric process. The process is much used by Prof. G. C. Caldwell, and is described by him in the "First Annual Report of the Cornell University Experiment Station."

We have employed the method by using a burette instead of the ordinary apparatus, and have found the process accurate and very satisfactory. The results correspond very closely with those obtained by chemical analysis. We insert a description of the instrument, and the process by Prof. Caldwell, as it is of

great intent to dairymen, not to mention chemists. The process is peculiarly useful in butter and cheese factories.

"A simple, and at least tolerably accurate method of testing milk, which shall not only give some idea of its quality, but shall also detect adulteration or skimming without fail, is acknowledged by all to be one of the great desiderata, especially in butter and cheese factories. * * * * A method of examination of milk, by which such information may be gained, that requires no expensive apparatus, and is easy and quick in execution, is found in Marchand's lactobutyrometrical process, as more recently modified by two German chemists, Schmidt and Tollens; in their hands, its indications came nearly always within 0.2 per cent. of the truth, and usually much nearer than that. In the case of thirty-nine determinations of fat in milk of all degrees of richness, made by the chemists just named, in no instance was the difference between the result obtained by this method, and by the most accurate chemical method, greater than 0.2 per cent., and in all but fourteen tests it did not exceed 0.1 per cent.

In twelve cases the two methods of analysis gave almost the same results.

DIRECTIONS FOR THE USE OF THE INSTRUMENT.

"Into the lactobutyrometer, a glass tube closed at one end and provided with a graduated scale near the open end, put, first, exactly ten cubic centimeters of the milk; this is done by filling the pipette marked *milk* with the milk to be examined, up to a short distance above the mark on its neck, by suction at the upper end while the point is dipped in the milk, then removing the pipette from the mouth and quickly closing the open end with the ball of the fore finger before enough milk runs out to bring the level below the mark; then remove the point of the pipette from the milk, wipe it off, and holding the instrument with the other hand so that the mark on its neck is on the same level with the eye, slowly and slightly raise one side of the finger closing the opening till the liquid begins to drop out at the lower end; when the level of the liquid just reaches the mark, close the opening again, hold the point of the pipette in the mouth of the lactobutyrometer and remove the finger from the upper opening; when all the milk has run out, allow about a

minute for the pipette to drain while held in the same vertical position, and finally blow out the last drop that remains adhering to the narrow opening below; during this operation it is best that the lactobutyrometer should be supported in an upright position so that it will not be necessary to hold it, and both hands will be free to manage the pipette; and care should be taken not to touch the sides of the tube with the point of the pipette, lest some of the milk which should go into the tube may remain adhering to its mouth.

Ten cubic centimeters of milk being thus transferred to the tube, next put into it exactly ten cubic centimeters of ether, with the aid of the pipette marked *ether*, then close the mouth of the tube with the cork that accompanies it, and, grasping the lower end of the tube in one hand and the upper end in the other with a finger over the cork to keep it in place, give the contents of the tube a vigorous shaking, carefully lifting the cork two or three times to allow vent for the ether vapor that accumulates in the tube. When the liquid presents the appearance of a uniform creamy consistency, without any visible clots, remove the cork and add, by means of the pipette marked *alcohol*, exactly ten cubic centimeters of this liquid, close the tube again and, at the same time, pour some of the alcohol, to the depth of about half an inch, into the saucer at the base of the brass cylinder, which also accompanies the apparatus, and which has previously been three-fourths filled with water, and set fire to this alcohol; while the water is thus being heated, give the contents of the tube another vigorous shaking in the same manner as before, with the same precaution in regard to opening the tube two or three times, till all the coarse clots formed when the alcohol was added are broken up, and the contents of the tube present a uniformly fine granular appearance. When the temperature of the water in the brass cylinder reaches 40 to 42 degrees Centigrade (104 to 108 degrees Fahrenheit,) blow out the flame of the burning alcohol, and put the lactobutyrometer in this warm water. The solution of fat immediately begins to collect at the top of the liquid; when, after five or, at most, ten minutes, no more fat globules appear to rise, and the layer of the solution does not increase in thickness, the lactobutyrometer is put in the glass cylinder which has already been nearly filled with water at a temperature of 20 degrees Centigrade, or 68 degrees Fahrenheit;

the fatty layer will become turbid and generally increase slightly in thickness, and finally, in a few minutes, it becomes clear and is then ready for measurement.

The number of the degrees is then read off on the scale on the tube, at which the lowest part of the meniscus or hollowed surface of the liquid stands, and also the degree at which the lower level of the fatty solution stands, where it meets the liquid below it, and from which it is distinguished by a sharply marked line; substract the second number from the first; search for the number expressing this remainder in the column headed *ether fat solution* in the following table, and against that figure in the column headed *per cent. of fat* the corresponding per cent. of fat in the milk will be found."

(The table will be found in the report referred to.) A full description of the process may be found in the report.*

We now pass on to the consideration of other adulterants.

2. *Sodium carbonate and bicarbonate.* An excess of alkalinity would lead us to suspect the addition of these substances. Evaporate the milk to dryness, incinerate the contents of the dish and to the ash add an acid. If carbonates be present effervescence, due to the liberation of carbonic acid gas, will ensue.

3. *Borax.* Evaporate to dryness, incinerate and test for boracic acid in the ash.

4. *Magnesium and potassium carbonates.* Test for carbonates in the ash.

5. *Sugar, caramel.* As the process for determining these substances is somewhat lengthy we refer to special treatises on analysis. (See the *Analyist*, March, 1880, p. 37.)

6.—*Salt.* Evaporate the milk to dryness, incinerate the contents of the dish. Taste the ash, an excess of sodium chloride is easily discovered. Test for excess of chloride with a standard solution of nitrate of silver.

7.—*Potassium nitrate.* Test for nitrates in the ash.

8.—*Turmeric and annatto.* Coagulate the casein with alcohol or an acid, filter and add caustic potassa to the whey. If turmeric is present the yellow color becomes brownish. If annatto be present a red color is given.

* The instrument is made by Childs & Jones, Utica, New York.

9.—*Flour, etc.* Flour, starch and arrowroot give the characteristic blue color when tincture of iodine is added to the milk after boiling. The microscope will detect the starch granules if the milk has not been boiled.

10.—*Gum-tragacanth, gum-arabic and dextrine* are detected by alcohol which, when added to the whey, causes a precipitate of flakes to fall.

11.—*Chalk.* Let the milk stand in test-tube. If any considerable quantity of chalk is present it will precipitate. A drop of acid added to the precipitate will cause effervescence.

12.—*Gelatine.* This will coagulate on boiling and settle to the bottom of the test-tube.

13.—*Glycerine.* (see Blyth, p. 49).

14.—*Brains.* Detected by the microscope.

D.—EFFECTS OF IMPURE MILK ON THE HEALTH.

It is our purpose in this section to consider the effects resulting from the use of skimmed and adulterated milk. Milk from diseased cows as a cause of disease in man will be dwelt on in another section.

Skimmed milk is milk deprived of its most nutritious ingredient—the fat. Hence, to expect such an article of food to be as nourishing as rich milk, would be folly ; nor would one hope to have a child thrive on milk that had been diluted with water, or otherwise adulterated. We have seen that skimming and watering are almost the sole methods of tampering with milk, and that other forms of sophistication are rarely met with in this country. If we leave diseased milk out of consideration, for the present, we will have to look to impure milk, as above described, as the great factor of mal-nutrition. Feeding a child on milk bereft of its most nourishing ingredient will result in starvation.

In order to have an infant thrive well on cow's milk, the composition must be as nearly like human milk as possible, and any disturbance of the normal relations of the various ingredients must be avoided, or derangement of the child's health will almost certainly follow. The fat, the casein, the sugar and the salts, must be given in natural proportions, or harm will result. Skimmed milk is deficient in fat while it contains an excess of casein. A diminution in the quantity of cream will be followed

by wasting; an excess of casein will cause gastric and other troubles; while too little of the salts may cause serious changes in the bony framework. Cream is the most digestible form of fat. "It will often be found in practice, that the addition of a little more cream to the baby's food will correct any mild indigestion, due to an excess of casein." (*Wiggin.*)

The principal and most fatal diseases of infancy are those characterized by wasting, that is the system loses its fat. Adipose tissue will not accumulate in the system if health is impaired, or if fat is not supplied from without, in the food. Wasting is a sign of defective nutrition. Now, if we try to nourish a child on skimmed or watered milk, fat in insufficient quantities is supplied, wasting results, death may follow; or, in other words, the child is starved.

"Of all the deaths that occur in the great cities of North America, from a quarter to a third take place under one year of age, and from two-fifths to one-half under five; out of one hundred live-born children, about twenty-five die before the end of the first year of life, and from forty to fifty before reaching the close of the fifth year." (*Curtis & Jarvis.*)

Milk being the principal article of diet in infancy, we naturally turn to that period of life to find the effects of impure milk; and it is just at that period of life that we note the highest mortality. Thousands of children perish annually from starvation, due to feeding on skimmed and watered milk. "The skimming and watering of milk—the darkest feature of which is the increase in the rate of infant mortality thereby caused—should be stigmatized as a grave crime; and the offender, when brought to light, should be subjected to some severer penalty than a paltry fine. Once let it be understood that the perpetrator shall be subjected to some ignominious punishment, proportionate to the offence, and, what is now considered as a trivial misdemeanor, will henceforth take rank among the impermissible as well as forbidden offences." (*Nichols.*)

That infant *morbility* and mortality are increased and caused by the use of impure milk, is no idle fancy; that poor milk is a factor, is proved almost daily in the practice of physicians having much to do with children's diseases. Where is the physician who has not seen cases of slow starvation of infants, resulting from the use of this inferior milk? The merest tyro in medicine accepts these facts as proved beyond doubt.

It is not long ago that three children died of starvation in the practice of Dr. Da Costa, of Philadelphia. The cause of death was found in the milk which analysis proved to be skimmed and then watered one and one-half times*.

Authorities and instances might be cited at great length to prove the truth of these statements, but our space will admit only of the bare mention of facts as given.

Is it not time, then, that the sale of this impure food was stopped? The sale will go on, despite legislative enactments, till checked by energetic health officers in our towns and cities, and to them the public look for relief.

E. MILK FROM DISEASED COWS MAY CAUSE DISEASE IN MAN.

It is conclusively settled that many of the diseases of cattle are transmissible through the milk, and it is indeed fortunate that this secretion diminishes or disappears in many of the diseases of animals; notably anthrax.

Tuberculosis, without doubt, may be carried into the human system, by the milk from cows sick with that disease. In a cow which was sold to be killed, Pench recognized the existence of phthisis. Milk from this cow was fed to pigs and rabbits. These animals thus fed, when killed showed tuberculous lesions in the lungs, intestines and elsewhere. The experiments made were quite conclusive and proved, without doubt, that tuberculosis is transmissible from the cow to other animals by means of the milk.

Experiments similar to these, made in Germany, and by Burdon, Sanderson and Wilson Fox in England, also prove that tuberculosis can be carried and will produce disease in healthy animals when the milk or flesh of these animals is used as food. Tuberculosis is a very common disease in cows, especially when they are improperly housed or fed. The stables in our cities should be closely watched, as the danger of transmission is a real one, and proper precautions should be taken to check the sale of milk from cows sick with phthisis.†

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* Amer. Journ. Med. Sci. July, 1880. p 271,

† Vide *Med News and Abstract*, Sep. 1880, p. 533; *Br. Med. Journ.*, July 31, 1880; *N. Y. Med. Journ.*, Vol. III, pp. 241 and 321. "Tuberculosis of milch cows and the contagiousness of Tuberculosis, etc.," A. N. Bell, Am. Med. Ass'n, 1877; Forc., p. 484; Blyth, p. 54 *et seq.*

Milk from cows affected with the foot and mouth disease (Aphtha Epizootica) when taken into the system, is the cause of serious ill health. The disease is an exceedingly contagious one prevailing among cattle and other animals. The following train of symptoms follows the ingestion of milk from these animals; loss of appetite, nausea, accelerated pulse, swelling of tonsils and submaxillary glands, an outbreak of vesicles upon the lips and tongue. The lower extremities are covered with a peculiar cutaneous eruption.*

The results of analysis and microscopic examination of milk, from cows affected with this disease, are given in *The Analyst*, May, 1878, in an article entitled "Diseased Milk," by C. Heisch, F. C. S.

Pleuro-pneumonia is a very common disease among cattle, but the secretion of milk is, as a rule, checked in the early stages. Hence there is little possibility of it being used as a food.

The subject of transmission of diseases from animals by means of the milk is as yet in its infancy, the literature being small. But investigations are being made in Europe and in this country, and all published statements prove that it is extremely dangerous, to human life and health, to use the milk from diseased cows as food.

A source of sickness not mentioned above is found in the milk from cows secreted just after calving, and called colostrum. This produces diarrhœa in children. The microscope will detect colostrum corpuscles in such milk.

Milk contaminated with pus from an inflamed udder, or an abscess of the udder, will cause stomatitis and diarrhœa in infants.

It is hardly necessary to extend this section beyond these few hints; sufficient has been said to warn persons against the use of milk from cows not in perfect health.

F.—FEEDING INFLUENCES THE HEALTHFULNESS OF MILK.

That a healthy cow allowed to feed on rich meadow grass, and in the evening carefully housed, cared for and given a diet of meal and hay, will yield a rich, creamy milk, is evident; and that a child fed on this milk will keep in good health, grow fat

*Blyth, p. 56, *et seq.*; 2nd annual report of Mass. State Board of Health.

and prosper, is equally plain. On the other hand, we know that a sickly cow, fed on distillery swill, improperly housed and cared for, will yield a thin, watery milk; and that a child fed on such milk will lose health, have diarrhœa and waste away. These facts are almost self-evident; so patent are they that it seems hardly necessary to mention them. Yet, they are ignored daily, and people wonder at the mortality among infants in our cities. Let us examine the subject a little more minutely.

The influence of different kinds of food on the yield and quality of milk is an interesting question to the dairymen, from a business point of view. But, to us, as physicians and sanitarians, it is of vast importance as affecting public health. The consideration of the subject, in its commercial aspects, is foreign to the purposes of this paper; readers desiring information on this branch of the topic are referred to the admirable works of Flint and Thomson; to the reports of the agricultural boards of the various States, and especially to the reports of the Secretary of the Massachusetts Board of Agriculture.

It is our intention to look at the subject as a sanitarian, and see what foods do render the milk unhealthful. Great service would be done the State, if the subject was thoroughly investigated, for the attention it deserves has not been given to it. Many of the diseases of infancy are undoubtedly caused or aggravated by milk from cows fed on poor or unwholesome food. The length of this paper would be unnecessarily increased, if we were to devote the space to the subject that it deserves; we must content ourselves, then, by giving a few hints, with the hope that better and more thorough work will be done by another. We have selected for consideration points not touched on in books and not generally known to the public.

Brewers' grains. So much has been said in the public papers about this that it deserves our attention. Not much information can be obtained from books, as to the effect of milk from cows fed on brewers' grain, on the health of children, but little has been written on the subject. There is, however, a strong popular impression that the milk thus produced is unhealthful, and that health of infants is compromised or endangered by its use.

During the past spring and summer, we have taken pains to consult with farmers in all parts of the State, as to the effect on the health of cows by using this substance, and have accumu-

lated evidence from about seventy sources. The facts thus adduced will be noted further on.

This substance is obtained from breweries. After the barley is "malted," the malt is crushed, placed in a tub with hot water, and an infusion made. During these processes much of the starch in the barley is converted, by the action of diastase, into sugar and dextrine, and these substances go into solution. This infusion of the soluble parts of the malt is strained off, and the insoluble portions are sold under the name of brewers' grains, or beer grains. Beer grains, when dried, contain about ten per cent. of water, fourteen per cent. of albuminoid, twenty-one per cent. of sugar, thirty-two per cent. of starch, and six per cent. of fats.

Dr. Voelcker, of the Royal Agricultural Society, says: "Brewers' grains are much more nutritious than their appearance seems to warrant. Even in the wet condition in which they are obtained from breweries, they contain a fair proportion of ready-made and flesh-forming matters. Dried brewers' grains make good milk, and are fully as valuable, as a food for cows, as barley meal. It is the custom among our farmers, on account of cheapness, to feed this substance to cows, either alone or mixed with meal, hay, or other fodder. In some parts of the State, large quantities are purchased at one time, and stored on the farm, in pits and barn-cellars. The grains are generally wet, and if not used immediately, or if improperly cared for, they ferment, become sour, and in a short time, rot. When given to cows in a sour or rotten state, they cannot but be injurious, and produce poor milk. The evidence given by farmers proves that fresh beer grains, given in small quantities, mixed with other food, are not unhealthful, and that the milk produced is of good quality. When used to the exclusion of other food, or in a fermented state, the milk produced is thin and watery, with a small per cent. of cream; but the quantity is increased. The grains seem to act as a stimulant to the mammary glands, exciting the secretion of milk. As a rule, it increases the quantity, but impairs the quality. The opinion among the better class of farmers is, that the milking life of the cow is shortened by the use of this food, and that its use should be discountenanced.

As to the effect of milk thus produced on the health of

infants, there is great uncertainty of opinion among physicians, and it is believed that the use of this milk is followed by diarrhœa and wasting. One physician of note asserts that it is a fruitful cause of eczema in children, but as this disease is very common in childhood, even when the infant is fed on breast milk exclusively, this statement cannot be accepted as positive.

Distillery swill. Swill milk is rarely heard of now, but not many years ago it was a fruitful cause of disease and death in children. Fearing that the lessons of the past may be forgotten we are constrained to mention it as a possible cause of disease. Distillery swill "if properly fed in limited quantities, in combination with other and more bulky food, may be a valuable article for the dairyman, but if given, as it too often is, without the addition of other kinds of food, it soon affects the health and constitution of the animals fed on it. Where this forms the principle food of milch cows, the milk is of a poor quality; it contains, often, less than one per cent. of butter, and seldom over one and three-tenths or one and one-half per cent. Its effect on the system of young children is, therefore, very destructive, causing diseases of various kinds, and, if long continued, certain death." The adulteration of pure milk from the healthy cow by water, though dishonest and objectionable in the highest degree, is far less iniquitous in its consequences, than the nefarious traffic in "swill milk," or milk produced from cows fed entirely on "still slops," from which they so become diseased, after which the milk contains a subtle poison, which is as difficult of detection, by any known process of chemistry, as the miasma of an atmosphere tainted with yellow fever or cholera. The fact is sufficiently palpable, that no pure and healthy milk can be produced by an unhealthy and diseased animal, and that no animal can long remain healthy that is fed on an unnatural food, and treated in the manner too common around the distilleries of many large cities." (*C. L. Flint, pp.* 144, 208, 216.)

Where swill-milk was sold in New York, a few years ago, "it was found different in alimentary character from that produced by cows that were fed on grass, hay or grain. It was not so well digested in the stomach, nor had it the nutritive power to create flesh and sustain strength. The children lost flesh and failed to gain it. Their skins were pallid, sometimes discolored and corrugated. Their countenances had the appearance of old

age, rather than the bright and lively bloom of childhood. They suffered from diarrhœa and dysentery and great debility, and many died." (*Jarvis.*)

Fortunately, no "swill-milk" is sold in this State at the present time, but it is well for health officers to be on the lookout for it. The sale of it is, in this State, considered a misdemeanor, punishable by a fine of fifty dollars and imprisonment for thirty days. The laws of Massachusetts, New York, Michigan and other States also forbid its sale.

Various plants, when eaten by cows, affect the taste and color of milk. It is well known that turnips and wild carrots impart a very unpleasant taste and odor. The poison oak, (*Rhus Toxicodendron*) when eaten by cows, so affects the milk that it is almost a poison to children. When a child takes this milk, there is extreme weakness, vomiting, a fall of temperature, the tongue is swollen and dry. *Parkes.*

The taste of milk is altered by cows feeding on the following plants: wild turnip, charlock, rape, wormwood, ramsons, cypress spurge, hedge hysop, black hellebore, German chamomile, maize. Color is imparted to milk by the following: Yellow bedshaw, madder and species of carex, scirpus, equisetime, ranunculus. Euphorbia gives a reddish color, and the milk is made blue by alkanet, water violet, purple cow wheat, perennial mercury, common knot grass, buckwheat, yellow rattle. (*Calder.*)

G.—MILK AS A VEHICLE OF CONTAGION.

That milk will act a carrier of the germs of contagious diseases is proved beyond doubt. Epidemics of typhoid fever and scarlet fever, occurring in England, have had their origin in contaminated milk.

An epidemic of typhoid in the town of Eagley, England, was investigated by the medical inspector of the Local Government Board. It was found that a small brook had been used by the mill operatives so that large quantities of fecal matter were daily emptied into the stream. It was also found that one of the workmen was ill with a disease supposed to be typhoid fever. The water from this brook was used at a dairy and was the only supply in use. There was no positive evidence that the milk was diluted with this water, but it was acknowledged that the milk cans were washed with it. Of fifty-seven families supplied

with milk from this dairy, fifty-five were attacked with typhoid fever. About one hundred and forty-six persons were sick with the disease. The inspector says: "Not one household, to which the milk was traced, did I find free from the disease."

An epidemic in Islington, England, was also traced to milk diluted with contaminated water, as the cause.*

Scarlatina. In an epidemic of scarlet fever in South Kensington, England, it was observed "that one of the first severe cases which initiated an epidemic, occurred in the house of a milkman whose wife milked the cows, the milk being supplied to about twelve families in the city. In six of these, cases of scarlatina occurred in rapid succession at a time when the disease was not epidemic, and without any communication having taken place between those that became affected and the persons who brought the milk. It is very probable that, in this instance, the milk was the carrier of the contagion, as, previous to the distribution to the several consumers, it had stood in a kitchen which before had been used as a hospital for a scarlatina patient."†

English public health reports and medical journals contain many instances like the above. The danger, then, is a real one and the public should be warned in time to avert any such epidemics in this country.

H.—LAWS BEARING ON THE SUBJECT OF OUR MILK SUPPLY.

The dangers to public health arising from the use of adulterated, skimmed and diseased milk having been pointed out, it will be well for us, now, to review briefly the character of the various State laws having for their object the regulation of the trade in this article. We can then the more readily point out the imperfect or inefficient parts of these laws.

The first act on our statute books is that of April 7th, 1875, which reads:—"The sale or keeping of adulterated milk is a misdemeanor, punishable by a fine of $50, and imprisonment for 30 days. To adulterate milk, or to keep cows for the production of marketable milk in an unhealthy condition, or to sell milk as pure milk from which the cream has been taken are also

*For full accounts of these epidemics, see 8th Annual Report, Mass. State Board of Health; *Practitioner*, Vol. XVII, p. 225; Vol. XI, p. 234; *Med. Times and Gaz.*, Nov., 1870.

†*Practitioner*, Aug., 1876, p. 155; Oct., 1877, p. 307. 9th Annual Report, Mass. State Board of Health.

punishable as above. The addition of *water or any substance* is defined as an adulteration. Milk from cows fed on distillery waste (commonly called "swill") is declared impure and contrary to this act."

This law is a public health measure and aims to secure for the people a supply of pure, healthful milk. If the mere enacting of a law could do good, this act would be all that was necessary. But it has remained on our statute books for more than five years, inoperative and is practically a dead-letter. We doubt if a suit or conviction has been had under it. Many reasons may be found for this law not being enforced.

It fails to reach the great mass of petty offenders in our larger cities. Citizens will not take the time necessary to follow up a suit, nor will they, if fraud is really detected, act as complainants. The fines are too low, if we consider the enormity of the crime, which is looked on only as a misdemeanor. Besides all this, no standard of purity is fixed by law, on which to base degrees of sophistication.

If we were allowed to modify this act so as to make it practical we would suggest the following alterations:—The burden of its enforcement should be placed where it belongs, on the public health officers in the towns and cities, and they should be held responsible for carrying out the requirements of the act. The fines and imprisonment should be made proportionate with the crime committed; we think the public is endangered by the sale of impure milk, and the crime should be punished by a heavy fine and long imprisonment. A standard of purity should be fixed by law, and officers, competent to determine the degree and character of adulteration, should be appointed to make analyses for the health officers in our towns and cities. We have stated in a previous section what that standard should be.

The milk act should be a part of a general law against the sale of adulterated food of any kind.

The other laws, bearing on the subject, are purely trade measures, and have for their object the prevention of dishonest competition in the milk trade, and are not intended to guard the public against unhealthful milk. These laws read as follows:

Act of April 5th, 1878: Every person who shall sell, or who shall offer or expose for sale, any milk from which the cream, or

any part thereof, has been removed, shall distinctly and durably stamp or mark, in letters not less than two inches in length, in a conspicuous place, above the centre, upon the outside of every can, vessel, or package containing such milk, the words "skimmed milk," and such milk shall only be sold or shipped in or retailed out of a can or other vessel so marked.

Violations of this act are punishable by a fine of $50. The sale or exposure for sale of milk contrary to this act is presumptive evidence. The non-payment of the fine is punishable by imprisonment.

Act of March 12th, 1880,—supplementary to the above act: The State Milk Inspector is appointed and empowered to open any can, vessel or package containing milk, whether sealed or otherwise, or whether in transit or otherwise; and if upon inspection he shall find such can to contain milk which has been adulterated, or from which the cream, or any part thereof, has been removed, the inspector is empowered to pour the contents of the can upon the ground, and bring suit against the person violating the law.

Any citizen may act as complainant under these acts.

It may not be amiss to look at the objects and bearing of these last two acts. Prior to the passing of the act of 1880, which created the office of milk inspector, there were laws, which, if enforced, were sufficient to check the sale of impure or adulterated milk; but the great trouble was found in having them enforced, consequently they were practically inoperative.

The history of these acts is pretty much as follows: The sale of milk was greatly interfered with by unprincipled dealers in different parts of the State, who shipped inferior or watered and skimmed milk, and obtained prices as high as those received by honest men who sent pure milk. To check this fraud, the act of April 5, 1878, was passed. This act, a purely commercial one, had for its sole object the prevention of dishonest and unfair competition. The law, which was copied from that of New York, was on the statute books for years, and not a single suit was brought under it, no person being found to act as complainant; the law being a dead letter for two years, it was thought, by the milk producers, that if some one person was appointed to look after their interest, at the expense of the State, the objects sought for would be obtained.

In accordance with these views, the act of March 12, 1880, which is supplementary to the previous one, was passed, and the office of State Milk Inspector created.

The two last acts protect the public against the sale of skimmed milk to a slight extent only. We have previously remarked that the supply of our cities comes from farms in their vicinity and not a large quantity from distant points, and that the bulk of the milk produced by dairymen is shipped to New York, hence the interests of our people in this case are secondary to those of the people of New York City.

We have, then, laws perfectly competent, if enforced and if modified to a slight extent, to check the sale of impure milk, in this State. It is not for us, in an article like this, to criticize the laws; it remains for others to alter the laws so that they cover the ground.

I.—INSPECTION.

We have thought it well to draw up a short scheme for the use of milk inspectors in making systematic examinations. A man to act as an inspector, must be a good judge of milk and, without the aid of any instrument, he should, from the taste, odor, consistence and appearance, tell whether the milk is a specimen of genuine milk or not. If he use the lactometer, this knowledge is especially necessary, for the lactometer is useless except in the hands of an expert. He must be conversant with the workings of the milk business, from the time the milk leaves the the cow to the time it is delivered to the consumer. He should likewise know the "tricks of the trade." It is well to be provided with a lactometer and lactometer glass, a floating thermometer and a number of four ounce bottles in which to put the samples.

Scheme.—The taste and odor should be noticed; upon rubbing the milk between the fingers it should give the feeling as if it had "body." Now stir the milk well, and take a sample from the centre of the can and put it in the lactometer glass; take the temperature if necessary; apply the lactometer; watered milk will run between between 80° and 105°; skimmed milk may mark from 110° to 125°. If suspicious, take a sample and label the bottle with all marks on the can and the date. An analysis may be made as follows: *Analysis.*—Take the specific gravity

in a 100 gram bottle; set for cream in a cool place and read off the per cent. in twenty-four hours, and notice any sediment.

Thoroughly mix the sample and weigh out five grams in a tarred platinum dish; evaporate on a water bath for three hours; dry and weigh. Loss in weight equals water; weight, less the weight of dish, equals total solids. Extract fat with ether or benzine; the loss equals the fat. Now ignite and when the dish is cool weigh; weight equals the ash

Test for adulterants, sodium, potassium and magnesium carbonates; borax, potassium and magnesium nitrate; sodium chloride; chalk, etc. The casein and sugar may be estimated after the fat is extracted, but this is rarely necessary.

Take a fresh sample and examine under the microscope. Note starch grains, blood corpuscles, pus corpuscles, colostrum corpuscles, Blyth's bodies, etc.

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CONTAGIOUS PLEURO-PNEUMONIA.

EZRA M. HUNT, M. D.

It has been the duty of the Secretary of the State Board of Health, for the past year, to have frequent correspondence with those who have to do with the diagnosis of contagious pleuro-pneumonia, and to aid in its investigation in this State. Few diseases of animals are as interesting as this is in its comparative study. It requires the acute analysis applied to the various zymotic diseases and needs to be traced also for the light which it may possibly throw upon epidemics. While a specific disease, it results almost exclusively in a local affection, so that it has to be treated much as a disease of the respiratory organs. Its one great lesion becomes the absorbing thought in the study of the disease, although this must not be to the exclusion of its study as to its constitutional effects. This is made all the more significant by the fact that inoculation in the flesh, as upon the ears or tail, not only will give the specific disease, but divert its concentration from the lung and at the same time secure immunity from attack. It is made benign, not so much by the local mildness, as is sometimes demonstrated by tailless cattle, but because it is thus diverted to another centre for its activity.

Without repeating the history of diseases, or relying entirely upon the text-book authorities, we purpose to seek an answer to the following questions:

Have the laws of its contagiousness or communicability been determined?

Are its lesions so distinct as that its diagnosis from all other forms of lung diseases can be determined from post-mortem appearance alone?

Do the thermometer or symptoms distinguish it from other lung diseases of cattle?

How are we to arrive at its diagnosis as an infectious pleuro-pneumonia?

What is the period of its incubation?

Can an animal that has fully passed the acute stage and returned to feeding, to milking and to apparent health, communicate the disease?

Question 1st.—Have the laws of its contagiousness or communicability been determined? It is first to be noted that much which is accepted as proof of contagion is not really such. Terms such as epizootic (epidemic) infectious, transmissible, etc., are confounded.

The secretions of a cholera patient or a typhoid fever patient may communicate the disease, but the person not, or neither may communicate and yet the secretions after voidence, standing and change, i. e. after a number of hours more or less may communicate the disease.

Or, as it is claimed in yellow fever, the patient may be harmless, while the things and surrounding (fomites) may communicate the malady.

Or, a disease may be in the atmosphere so that there is what is called an epidemic constitution of the atmosphere.

Or, like cerebro-spinal meningitis, it may prevail, not because one animal catches it from another, but because numbers are subjected to the same unfriendly influence.

Dysentery often prevails as an epidemic or endemic when it is not contagious.

The pathology of puerperal patients, so far as the peritoneum is concerned, is the same as the non-infectious form.

So a great deal of the average testimony as to the contagiousness or communicability of a disease, needs to be sifted and treated, not by the test of prevalence, or of seeming confinement to localities, but by close and exact evidence as to individual communicability.

It is generally believed by authorities that the form of pleuro-pneumonia of which we write is communicable from animal to animal, and also by the surroundings of infected animals. Although classified and tabulated facts arrived at by such methods of exclusion as exclude other possible sources of prevalence are too scarce as yet. The common sentiment and obser-

vation of veterinarians concludes it to be communicable through contagion.

The lines of its contagion are not very well defined. We have good reason to believe that most contagions are particulate, i. e. not gaseous but consist or reside in minute particles. Most of these are diffused slowly. The yellow fever poison seems to cling near the ground, and scarlet fever poison is not communicable to the same distance as measles.

There is some reason to believe that the ferment of the lung plague is not very diffusive, and that animals two hundred or three hundred feet distant are not in the area of the poison.

Are the lesions so distinct as that its diagnosis from all other forms of disease, or of local affection can be determined from the post-mortem appearance alone?

To an observer of a post-mortem where an animal is killed with pleuro-pneumonia and has one sound lung, the contrast at once convinces of something—one lung is say of two and a half pounds weight, the other cf twenty to thirty pounds. There is effusion of a liquid—there is a thickened pleura, both of the part next to the chest wall and of that covering the lungs. There is plastic exudation, both inter-pleural (L) and in the interstices of the connective tissue, which leads to organization and so gives to you all the solidity of fibrinous exudation. It is just this that constitutes the pathology or lesion of the disease. "All the other organs of the body are, as a rule, found to be in a state of health." There is variation in the amount and consistency of the watery or gluey fluid, after the plastic exudation so rapidly organizes as to bind down the pleura and lung so that you need to peel it from the chest wall.

The pneumonia is chiefly interstitial and magnified because of the abundant connective tissue in the cattle. Neymeyer's definition of interstitial pneumonia (vol. i, pp. 162 and 192) as an inflamation, involving the walls of the air vesicles and the inter-lobular connective tissue, "is fully descriptive as to kind." Only the amount is magnified because the bovine animal has so large an amount of connective tissue in the lung, and because the "pneumonic lobules are separate blocks of tissue." By the exudation and by the conversion of the inter-lobular tissue into granulative tissue and connective tissue, the lobules themselves pass to a stage of stuffing or impaction, and so you get necrosis or a strangulated death of the lung substance.

If the animal does not die, but goes on to recover, the dead portion of the lung becomes encapsulated or encysted by "the false membrane over the pleura, and the inter-lobular and peri-bronchial spaces."

Now in all this, as to the pathology of the lesion, so far as quality or method of change is concerned, we have nothing pathonomonic or distinctive of an infectious or contagious malady. As we read or study, side by side, the various changes that take place in pleuro-pneumonia, or chronic interstitial pneumonia, in the adult and in the animal, the terms of description and the records of lesion as to the character of the exudation, its organization, changes and results, it is hard not to come to the conclusion that Leaning does, that if there is a contagious pleuro-pneumonia in animals there is also an analagous infectious pleuro-pneumonia in adults, and between the two, as he finds them in the adult, he makes only such pathological distinctions as these. In one, the pneumonitis is the principal lesion; in the other, the inter-pleural plastic exudation. "He makes the essence of distinction to consist in the more excessive and intense hyperplasia of the blood, its tendency to throw out plastic or fibrous exudation being such that "wherever there is celluloid connective tissue there is plastic exudation."

While the medical profession generally recognize cases of common pneumonia, to which all these facts attach, it is significant that they regard it not as a contagious disease, although, at times, largely prevalent, but as a severe and malignant type of usual pneumonia, which is also generally a pleuro-pneumonia.

While some veterinarians have asserted to us that it is possible from the post-mortem lesions of the lung alone, to pronounce a case one of infectious pleuro-pneumonia, yet on presenting the specimens to five of the most eminent pathologists of New York City, three of whom have examined cattle lesions also, they plainly declared that while from the rapid plastic or pleuritic exudation and its "tremendous" rapidity of solidification, there might be grave suspicion and inference that the disease was specific, yet that the same pathological order of change was common and not distinctive. The very points that had been named to us as differential, where shown not so to be by those who believe in a contagious pleuro-pneumonia.

"Some have supposed the very extensive exudation into the

lung structure and its marbled appearance, are indicative of some specialty in the inflammatory process; this is not, however, the case, for it is found that ordinary pneumonia, caused by cold, induces the same anatomical condition of the pulmonary parenchyma—the peculiar appearance being due to the anatomical fact, that the lungs of horned cattle contain much connective tissue and that the air cells are separated into groups by such connective tissue."

Prof. Williams, of Edinboro', in his Principles and Practice of Veterinary Medicine, quotes Strangemayer with approval, thus:

'All this, however, is not intended to and does not discredit the idea of contagion. The same structural or tissue changes occur to an organ from causes totally different. So pneumonia, arising from very different causes, does not have lesions corresponding to the variety of causes. Puerperal fever, although so distinctly communicable, so far as the peritonitis is concerned, has no distinct lesions. Although the pleural adhesion and infusion are marked, yet common pneumonia is generally pleuro-pneumonia.'

Loomis has said that in pneumonia nothing is so frequent as adhesion of the lung to the pleura.

Prof. Janeway states, that in one hundred and twelve cases of post-mortem of pneumonia, only ten were found entirely free. While there is a field for the comparative study of the lesion, it is not chiefly as to its pathological distinctness.

The degree of lesion, the habits of the disease, the natural and physical signs and evidence of the source of contagion, must be sought as diagnostic. Then the effects of imparting the disease to other animals by inoculation from the diseased lung as a crucial test, are worthy of consideration. Where all such facts are weighed, studied and compared, we have the greatest respect for conclusions, but we must claim that from post-mortem appearances *alone*, it is seldom wise to assert a positive diagnosis. And we must also say, that diagnoses have sometimes been made with a facility and celerity appalling to any medical clinican.

Does the thermometer distinguish the contagious pleuro-pneunomia from all other diseases of cattle, and especially those in which the lungs are affected? The thermometer is merely a test

of animal heat, and as such is valuable only as a measure thereof. An excessive degree of temperature attaches to very many diseases and to none more than those of the lung. In the common pneumonia of men, it is not unusual to record a heat varying from 104° to 107°. If we find in a stable an accurate record for days of the heat, as in our hospitals, or as in the note book of private chemists, and are sure that with care as to thermometers and with all that precision which is so difficult with animals, and so exacting on the time, and nice observation of the attendant, that the record shows a very high temperature, this would aid in giving precision to the diagnosis, but not so as of itself to establish the disease. In a case in Camden county, in which nine animals died, the temperature was as high as 107°, but there was no lung lesion whatever, and the disease was not pleuro-pneumonia. How, then, is a diagnosis of the disease to be arrived at?

We have only to answer that it is by the history of the cases, the ability to trace the source of contagion, the natural and physical signs, the spread of the disease and the post-mortem appearances, by a summing up of all the facts in evidence. The rapidity of the fiterinous exudation and interstitial consolidation is an important index. An influenza, like the horse epizootic, may prevail and pneumonia may be epidemic without being contagious when real infectious pleuro-pneumonia is occurrent. There may also be cases of sporadic disease among cattle. The infectious disease is claimed never to occur spontaneously in this county, but always to originate from a previous case. If, therefore, there is no clew to contagion, it needs strong evidence to assure as to the specific nature of the disease. It is easy to arrive at a superficial diagnosis, and positive conclusions are made by men whose evidence would be cast out of any capable medical or veterinary court as incomplete.

WHAT IS THE PERIOD OF INCUBATION?

The period of incubation has not yet been accurately determined, but must be admitted to reach from ten to forty days, as a rule. We believe we have evidence of its occurrence three months after the purchase of an infected animal. This is the great difficulty in eradicating the disease. An animal may easily pass in an ordinary inspection, and yet be a conveyancer of

the disease. It is for this reason that we regard the usual inspections, as they have always been conducted, entirely insufficient to guard against the disease. Acute cases only are likely to be discovered, and drovers soon become wise enough not to bring these over by usual routes. While there should be full powers of inspection, this cannot be the sole or chief reliance. So long as pleuro-pneumonia exists in any part of any State, every man who brings any cattle in the State, should be required to define the locality from which they came, and give a certificate of health, and be held accountable for any outbreak in the animal for three months. All newly-purchased stock should be kept apart from the common herd. Any slight cough or other ill condition of health should be carefully watched.

Can an animal that has fully passed the acute stage, and returned to feeding, milking, and to apparent health, communicate the disease?

This is a most important question, since, over and over again, a quarantine has been continued, because of the assertion that recovered cattle are still dangerous. It has been assumed that any animal having once had the disease, may at any time after apparent recovery, become the focus of a contagion, and so infect other cattle. It is assumed that because an animal once affected, may continue to have one lung, showing that there has been disease in it, that, therefore, the "capsule walling up the diseased germs may break down, and the imprisoned germs escape, and so another outbreak occur." We submitted that point to an eminent medico-veterinary authority, who replied: Who saw the germs? Where is the record of one fact that any such case ever did break down and release imprisoned germs? Because a part of a lung becomes necrosed and encysted, that does not prevent recovery. We constantly have similar conditions in human recoveries. Nor does a lesion retain the specific character of the disease causing it. Caseous degeneration, or necrosis, or other changes resulting, are in fact always quite distinct from the original cause thereof. The suggestion that such animals may, at any time, become foci of contagion, is not supported by evidence.

Dr. Yeo, one of the best of recent authorities, says: "The exudates do not tend to become highly organized, but to change to a cicitricial tisssue, or degrade into lower forms of matter, i. e.

caseous or calcareous." We have seen, the last summer, cases which had been pronounced pleuro-pneumonia, and had recovered with signs of consolidated or necrosed lung; yet they were kept in close stables, and with numbers of other cattle. After a lung has thus passed into a necrosed or cicatricial state, there is no probability that by any outbreak it can again become the centre of a specific contagion. The reason why we advise the fattening and slaughter of recovering cases, is rather because there is danger of infection during the prolonged recovery, and because milch cattle are not likely to do as well with one lung, or a part thereof, permanently impaired. It would, at least, be worth while that some of these lungs which had been harmless for months or years, should have some of their juice inoculated into other animals, to see whether genuine infectious pleuro-pneumonia could be produced.

What are the laws and restrictions that are justifiable, and on what kind of evidence must the claims for their enactment rest?

We first claim that it is due that the presence, degree and type of infectious pleuro-pneumonia should be established by the most indubitable evidence, before severe restrictive measures are resorted to.

It is no longer enough that this or that authority give their opinions. They must state the grounds and evidence of their opinions so that other experts, too, may sift the facts and draw their conclusions. Or, at least, they must by former subjection to such tests have established their claims to speak *ex cathedra*.

We believe, therefore, first of all, that all states should in the case of this or other suspected contagious disease among animals, have its constituted authorities, with power enough to find out and decide and with diligence enough to give the grounds of their conclusions, in order that there may be reasonable evidence as to suspected contagions.

On satisfactory evidence thus furnished that any contagious disease among animals exists, isolation should be promptly secured, and such authority be granted as the communicability of the disease justifies.

It is important after such methods of test as are due alike to science and art and due to the owners and to their individual rights, that large powers should be given, since upon full authority and its exercise may depend the entire question of spread.

The rule in all contagious diseases is to give large police and sanitary powers and then hold officers accountable for their judicious execution. The man who always exercises power mainly because he has it, or who hesitates to exercise because of the opposition of interested parties, cannot be entrusted with such a law.

Large powers are only meant as discretionary powers, and where exercised beyond a limit which the facts in evidence justify, no class so abuse and misuse power as those who are largely entrusted therewith. The very confidence thus reposed in them is a declaration of a belief that they will act only upon evidence such as will be satisfactory to the common sentiment of experts which, in our country, always has, if not a full popular approval, yet a noble and sustaining constituency of those who are always ready to defer to the expressed statements, evidences and opinions of a majority of careful investigators.

Errors of judgment when they effect rights of property or life are as serious as if they were errors of financial cupidity or other ill-intent. This does not inculcate hesitancy in action, but it does include discernment both in resolve and execution and ability to defend action in a way satisfactory to the common intelligence of judges.

The peremptory slaughter of animals, their forcible detention and inspection in transfer, and the closing up of avenues of trade by summary ordinance are acts to be justified by the facts in evidence. Those that act promptly with good reasons, therefore, are to be commended; those who act upon grounds that will not stand the test of close examination are to be condemned, just in proportion to the magnitude of the trust committed to them. When a disease like pleuro-pneumonia is epidemic in any locality, large powers to prevent spread must be conferred and exercised. The welfare of animals is a large interest in the State.

The hygienic sanitary measures, necessary for their health and the prevention or limitation of contagious diseases among them, is among the clear duties of the State. It concerns not only a pecuniary or humanitarian interest, but bears directly upon the health of the people.

The laws which effect them are very similar to those that effect human health. It is found that the care of the one is quite a measure of the care to be extended to the other. In the matter

of epidemics, (epizootics) or contagions and the various laws of communicability or transmission, these diseases are of intense interest, since by these we may study all contagions.

It is evident to any one who examines a lung of an animal with acute pleuro-pneumonia, that it is so rapid in fibrous exudation and in interstitial consolidation, that the only hope of a case is in very early treatment and a profound impression upon the inflammatory and exudative process. Bleeding and large rapid doses of calomel, and later, counter-irritation after removal of the hair, need exact trial under testing methods. Milk, with lime water and defibrinated blood, may be easily and largely given by drench to meet any reduction from treatment which is less rapid than that from the disease. Cows' blood, stirred well while fresh, so as to remove the strings of serum, leaves a juice of great value for alimentation in such cases. If farmers would use such preventive treatment as we have indicated in circulars, and would have skilled veternarians examine affected herds, so as to see each case in its start, we are sure its extension could be limited.

In the last few years, biologists and pathologists and the medical profession have been most earnestly studying the laws of contagion and of the production, dissemination and virulence of disease, using comparative pathology and other comparative studies as a most important means of information. For this reason, in England and on the continent, medical men have been prominent as authorities on the disease of animals, and co-operate with educated veterinarians in their attempts to prevent disease. It is due to veterinary science and art that both alike take a very deep interest in these studies. It is due to the medical art that physicians utilize the large opportunities, thus furnished, for the study of the laws of health, of disease, of physiology and pathology, as they affect human kind.

We feel that in the study of the lung disease of cattle, of these blood poisons, and of such a disease as infectious pleuro-pneumonia, there is still a large field for investigation, in which, recently, such men as Dr. T. Spencer Cobbold and Dr. C. S. Roy, Dr. Leaming, etc., have added to the labors of Fleming and Williams and Law.

As pleuro-pneumonia, like most of the contagious diseases of

animals, does not, thus far, admit of much treatment, the chief service that the State can be is as follows:

1st. To diffuse information that shall enable owners to suspect contagion, and so separate the animals before others are infected. Also to acquaint them with methods of disinfection and disposal and of avoiding the carrying of the disease.

2d. To prevent the irresponsible introduction of cattle from infected districts, by inspection, by regulative laws, and by holding sellers responsible.

3d. To provide means for the disposal of animals that have the disease, so that centres of contagion may not be preserved.

4th. To guard against modes of keeping cattle which tend to cause ill-health and diseased milk supply.

5th. To authorize inoculation under State oversight in herds already affected where it does not readily subside.

The present law, with slight alterations, can be made operative for these purposes, and at moderate expense, unless sudden outbreak or introduction of a contagious disease should require especial expenditure. The details as to its former management and some other suggestions will be found in the record made for the Board of Agriculture, and published in their report for this year as required by the law.

REPORTS OF VETERINARY INSPECTORS.

REPORT OF WM. B. E. MILLER, D. V. S., DECEMBER 31st, 1880.

The subjoined report will show the number of places visited where diseased animals were reported, the number sick at time of inspection, the nature of the disease, and deaths resulting therefrom as far as known:

March 24. Visited Benjamin J. Lord's farm, Parkville, Gloucester county; found no chronic cases of pleuro-pneumonia. Mr. Lord had lost several, and had one killed by Gen'l. Sterling's order.

March 30. Found one animal sick with bronchitis in a lot of fat steers. Examined at the Camden stock yards. The animal was slaughtered by J. L. Pierson, butcher, of Woodbury, Gloucester county.

April 1. Visited E. A. Bloomfield's farm, Elizabeth, Union county; found one chronic case of pleuro-pneumonia. Had lost some and had others killed by the cattle commission of last year.

Same date. Visited Jacob C. Dodd's, farm Lyons Farms, Essex county; found three chronic and one acute case of pleuro-pneumonia. Had lost some and had some killed by previous commission.

April 2. W. Cohen, Old Small-pox Hospital, Hoboken, Hudson county. One sick, had lost some and had others killed by other commission.

April 2. Mrs. Schuler, Blun street, Union Hill, Hudson county. One chronic case. Had some killed by previous commission.

April 5. Found three sick steers in a lot of forty. Inspected at the Camden stock yards. Were slaughtered for beef. Came from West Philadelphia stock yards.

April 14. Visited Bergen county; found one chronic case—

on one of the farms where cattle had been killed by the previous commission. Informed myself as to other herds which had previously been in quarantine.

April 6. Visited Manasquan, Monmouth county, and examined a cow on the farm of J. H. Morris; found it an acute case of pleuro-pneumonia. Lost one on the 18th and one on the 19th of February; had no other cattle. Also visited the farm of Shem Pierce, of the same place, and found one sick with same disease; had lost one three weeks previous.

April 16. Mr. McMullen, Jersey City, Hudson county; one cow sick of parturient apoplexy; died.

May 12. John Whittick, Hightstown, Mercer county, had two infected with pleuro pneumonia from herd of J. C. Fisher, on adjoining farm, who had several deaths and some killed by the State authorities last year. No deaths in Whittick's as far as known.

May 14. Joel Barkalow, Forked River, Ocean county, lost one cow with pleuro-pneumonia.

June 28. Visited Englishtown, Monmouth county. John H. Laird had one cow sick; had lost one from indigestion.

Same date. William B. Congden lost one from parturient apoplexy.

Same date. George Morris had three sick with indigestion; no deaths as far as known.

June 29. Visited Freehold, Monmouth county. Abijah Applegate lost five cows within a few days of each other; did not think it any contagious disease. None sick at time of visitation.

July 1. Visited Farmingdale, Monmouth county. Many farmers were losing cattle from indigestion, owing to the dry weather. Found no contagious disease.

July 2. Visited Ridgway, Lakeview, White's Bridge and Toms' River, and found that nearly every farmer had lost cattle as the result of the excessive drought.

July 19. Visited Robertville and Matawan, Monmouth county, and found the same state of affairs as at other parts of the country—cattle dying by the dozens from indigestion.

July 20. Visited Mount Holly, Burlington county. J. Ewing had five cows sick with lung trouble; had lost two,

C. H. Deacon had two sick with pleuro-pneumonia; killed one at this visit; had lost some before; has since had many others killed by State Board.

The disease was brought to this farm by the purchase of a cow from Caleb Ridgway, cattle dealer, that came from the stock yards of West Philadelphia.

Mr. Gaskill and Mr. Southwick of Pemberton, both bought from same drove and had their herds infected. Mr. Kelley, of Masonville, also had the contagion brought to his herd from the same source, and had several killed.

July 26. Dr. Ashhurst, of Mount Holly, had one sick cow which was killed. Not pleuro-pneumonia.

July 28. Visited Clayton, Gloucester county, and examined the herd of E. J. Davis and others, found three cases of pneumonia.

September 8. W. R. Hylton, Wrightsville, Camden county, had four sick with pleuro-pnemonia, has lost or had killed thirteen in all, infected by a cow from Philadelphia stock-yards.

September 9. Visited Turkey, Monmouth county. One farmer had lost two cows; found three more sick.

September 13. Visited Rieglesville, Warren county; found hog cholera very prevalent. The mortality very great.

October 1. Visited Mount Holly and examined two horses for glanders.

October 15. Visited Mount Holly and slaughtered two horses belonging to Ashmead Deacon, previously condemned for glanders.

October 11. Visited Sicklerville and Williamstown, Camden county, and found hog cholera very prevalent and fatal. Two cattle had died from phthisis pulmonalis verminalis.

November 1. Visited M. C. Brownings, Ellisburg; found one sick cow; had lost one. Made several subsequent visits to this farm; lost nine cattle in all. Disease "typhoid fever."

November 5. Visited Mullica Hill, Five Points and Ewans' Mills; found two farms infected with pleuro-pneumonia. Edward R. Lacy lost two steers, and had two more sick with it. Mr. Heritage lost one. They purchased these cattle from a drove which came from the Philadelphia stock-yards about three weeks before.

December 7. Visited Salem county; found pleuro-pneumonia on three farms, one death had occurred, and one was slaughtered at the time of visitation, and a post-mortem made of the carcass. These animals all came from one drove recently brought from Philadelphia. No other deaths since, as far as I know.

December 9. Visited E. Tomlinson's, Kirkwood, Camden county. Found one steer sick with pleuro-pneumonia; slaughtered the animal, and made a post-mortem, which showed the lesions of the last stages of the disease. Revisited this place on the 12th, and found another sick, which was slaughtered immediately These cattle were purchased in West Philadelphia about six weeks before, and came from West Virginia for sale.

Your obedient servant,
WM. B. E. MILLER, D. V. S.

To E. M. Hunt, Secretary State Board of Health.

BURLINGTON COUNTY, STATE OF NEW JERSEY.

MOUNT HOLLY, January 15, 1881.

Gentlemen:—I have the honor to inclose for your information, a report of the disease known as contagious pleuro-pneumonia, in my district during the present year:

It first made its appearance on the farm of Mr. Caleb Wilkins, Fostertown, Burlington county, N. J., June 9th, 1880. He had bought the cow of Mr. Caleb Ridgway, Vincentown, Burlington county, N. J., the preceding March. She died June 11th, 1880. She had been separated from the herd as soon as found ailing, and the rest of his herd did not contract the disease.

I was next called, June 21st, 1880, to inspect a cow suffering from contagious pleuro-pneumonia, on William G. Deacon's farm, near Mount Holly, N. J. She came from the same drove about the same time. Mr. Deacon has lost sixteen head. The same day (June 21, '80,) I condemned a case for the Hon. Job H. Gaskill, on his farm near Ary's Mount, Burlington county, N. J. He also bought two cows from Mr. Ridgway's infected drove last spring. He has lost ten head.

Mr. Joseph Kille, Masonville, Burlington county, N. J., bought a cow of Mr. Ridgway, some time in March, and on the 25th day of June, I condemned her and three others, as suffering from this malady. He has lost seven head.

Mr. H. H. Troth, Rancocas, Burlington county, N. J., called me to inspect his herd on the fourth day of August, 1880. I condemned two cases, and one cow had died prior to my visit, he not knowing it to be the cattle plague. He bought two cows of Mr. Ridgway, from the drove. He lost seven head.

Mr. William E. Gaskill, Juliustown, Burlington county, N. J., called me September 4, 1880. Condemned one cow. We suppose his cows took the disease from Mr. Job H. Gaskill's, as they pastured in adjoining fields before Mr. Gaskill's herd was quarantined. He has lost seven head.

Mr. Joseph Lundy, Rancocas, Burlington county, N. J., pastured his cows in an adjoining field to Mr. H. H. Troth's, in the early part of the summer, and during the month of September, 1880, lost three cases.

Mr. Rowland Stokes, Rancocas, Burlington county, N. J., pastured some young stock on an unfenced meadow near where we had Mr. Troth's cows quarantined. Two of his heifers jumped in and mingled with the diseased ones; and November 26th, I slaughtered one heifer for him, making in all eight herds affected. Slaughtered by order of State Board of Health, forty-four head; died of the disease, seven head. Total loss, fifty-one head from June 9th, to December 7th, 1880. One other cow, not seen by me, on the farm of Daniel Emley, Mount Holly, was slaughtered by order of State Board of Health. Although the disease appeared in a very malignant and contagious form in this county, we seem to have it under control at present; but we must be vigilant, and adopt all precautionary measures to stay its progress. We were fortunate enough to not allow it to spread from farm to farm after we were apprised of its appearance, by our system of quarantine, except, in the one instance of Mr. Stokes' cattle, above mentioned. Mr. Caleb Ridgway, Vincentown, Burlington county, N. J., bought the drove in question, from a man in a Philadelphia stock-yard, not knowing them to be diseased, and sold them to the farmers in our vicinity. Thus this fatal disease spread, causing our farmers to suffer great losses. Regarding the causes, symptoms, different stages, &c., of the disease, it does not seem necessary to occupy any space in my report. After infection, death is the only remedy that will stop its progress.

One of the Township Boards of Health reported two cases of glanders, which were slaughtered by order of the State Board of Health.

Respectfully submitted by your most obedient servant,

C. K. Dyer, D V. S.

REPORT OF J. A. MC'LAUGHLIN, D. V. S.

JERSEY CITY, JANUARY 1ST, 1880.

E. M. HUNT, M. D.,
Secretary, Board of Health of New Jersey.

SIR:—According to request I submit the following statement of work done by me since my appointment as cattle inspector.

June 9, 1880. Went to farm of Mr. Teese, distant about three (3) miles from Elizabeth, Union Co., found four (4) cases of pleuro-pneumonia contagiosa. Destroyed two (2); quarantined the remaining two (2).

June 25. Went to Mr. Donovans, Jersey City, Hudson county, found one suspicious case.

July 20. Examined eleven (11) head of Holstein cattle, at the Bremen pier, Hoboken, said cattle imported from Holland and the property of B. B. Lord, of N. Y. All perfectly healthy.

August 11 and August 16. Went to Lower Hackensack, New Barbadoes; cattle the property of Mr. Gross. Found one cow suffering from *simple* pneumonia. After a thorough investigation concluded that contagious pleuro-pneumonia was not on his (Mr. Gross') farm.

September 8th. Went to the farm of Mr. Theo. F. Young, Andover, Sussex county. After a thorough investigation convinced myself that contagious pleuro-pneumonia was not among his herd.

September 16th. Went to the farm of Cooper & Hewitt, Mr. George, agent, Charlotteburg. After a thorough investigation satisfied myself that contagious pleuro-pneumonia was not among his cattle.

October 21st. Went to Preakness Valley to farm, (Old Stag Farm.) Found one sick cow showing other symptoms than those attending contagious pleuro-pneumonia. Found, also, one (1) cow on which I held a post-mortem. Conclusion arrived at: No contagious pleuro-pneumonia.

December 22. I examined two hundred and seventy head of Western cattle about to be exported per steamer "Persian Monarch," (agents Patton, Vickers & Co.) I mention this casually as showing the increasing business with the foreign markets, the result of increasing confidence, and none of these had any apparent disease.

VARIOUS CIRCULARS.

ISSUED BY THE NEW JERSEY STATE BOARD OF HEALTH, AND COPIES OF LAWS ENACTED BY THE LEGISLATURE, BEARING ON HEALTH, VITAL STATISTICS AND THE CONTAGIOUS DISEASES OF ANIMALS.

PROTECTION TO BATHERS.

JUNE 1, 1880.

Our statistics show that from July 1, 1878, to July 1, 1879, one hundred and ninety-three persons were drowned in this State. Some at the sea-shore, or by the capsizing of boats, some in ponds, many while bathing in rivers or small streams, some in pools or cisterns. Many of these were good swimmers. Not all of these perish from real drowning. Some have heart disease made fatal by nervous shock, others apoplexy or some intense congestion, others syncope from exhaustion. It is not easy to decide on the moment whether the drowning is from any of these causes, and it is better to proceed on the supposition that the case is one in which death *has occurred* from the shutting out of the oxygen of the air. Cases where the hands are clasped and the fingers contracted are the most hopeful. "Those capable of inhaling and retaining a large amount of air in the lungs, and those who retain their presence of mind in the greatest degree, are those who resist the dangers of submersion for the longest time and are the most readily revived, while those who force nearly all the air from their lungs at the first shock can seldom be recovered."

"When a person falls into the water or is exhausted by the act of swimming, he goes beneath the water, then again comes to the surface, aided by the buoyancy of the air in the body and in

the clothing. In coming to the surface, realizing danger, he instinctively assumes the upright position, springs from the surface, and throws up the arms for help, at the same time endeavoring to relieve the desire for breath, by an inspiration, and to express the desire for aid, by calling out. This effort takes in water as well as air, and produces a slight spasmodic cough during which act the body goes beneath the surface the second time. As the consciousness of sinking becomes more acute, there is an agonized expression of the countenance which is indescribable, but which, when once seen, will be ever remembered and recognized—and at the same time frantic efforts are made to grasp everything that can be seen, whether within reach or not, and this desire continues even after having sunk, as oftentimes bodies are found clutching the weeds, grass, or stones, that may be found at the bottom of the water."

"Sometimes the air is so exhausted from the system that the body does not come to the surface after going down the second time, but generally there is sufficient inflation to bring it once more to the surface, when as soon as the head comes above the water, the urgency to take the breath has become so great that a full inspiration is made without due caution, and a large quantity of water and a small quantity of air are taken into the system. The water penetrating into the bronchial tubes produces a second fit of coughing, expelling what little air may be left, and the body sinks just below the surface or goes to the bottom."

Five minutes under water is the usual limit after which recovery is improbable in a case of drowning, but as there is not always the same amount of air exclusion, as the time cannot always be accurately stated, as syncope or nervous shock may have modified the lung and air condition, and as there may be slight inhalation of air before it is perceived, no case not known to have been *under water* half an hour should be regarded as hopeless. Persons have been recovered who for an hour have shown no outward sign of life. Places frequented by boys for swimming, and all bathing places and life-saving stations, should have definite provisions for such accidents, and should be required by their patrons each year to state precisely what these appliances are,—and to show that they are in perfect order for instant use and under such direction as to be readily at hand. An accident ought never to occur without a full knowledge beforehand of how most rapidly to secure aid and appliances.

Printed guides in public places near the water serve both as information and warning. Methods and skill depend on speed for success. For details we refer to an article prepared for the New Jersey State Board of Health by T. G. Chattle, M. D., and to be found in our report of 1879.

In a case just occurring, the boat seeking the drowned one should have in it a person whose duty it is at once to take charge of the recovered body and not wait to land before doing anything.

When needing to be removed there should be at hand a stretcher on which to carry the body. Some one on the shore should be securing things needed.

The body should be carried with the face and front downward. One person each side with hands joined across the thighs, and with the others passed under the arm-pits to the head, will give the chest most freedom, and help to empty water, froth or mucus from the chest or stomach.

Discipline or readiness for the accident is the first and best promise of restoration. Order hot bottles, dry clothing, electric battery, hypodermic syringe or other provided apparatus to be brought and thus be ready with whatever the person directing may want.

HOW TO TREAT THE DROWNED; HOW TO SAVE A LIFE.

I. Cleanse the mouth and nostrils quickly and loosen collar, necktie and other clothing if you can, so as to get at waist and chest, but do not lose time at this.

Roll the body over upon the right side and so on over upon the face, the face resting on the bent right arm. Thrust your finger in at the angle of the mouth, and if you find the tongue fallen back, press or draw it forward. (The second or third finger of the other hand or a knot in a handkerchief will hold the mouth open while doing this if need be.) Then standing astride the body and clasping your arms around it so that the fingers of your two hands interlace just over the navel, raise the body by a slight jerk three or four times so that all but the head and feet clear the ground. This is to clear the stomach and windpipe, and will not take a half a minute.

II. Then turn the body on the back with the head as low as the body. Draw the tongue forward to one side of mouth and pass a lead pencil or stick as thick as the forefinger, in from the side

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and across to the opposite back tooth, so as to keep the mouth a little open. (The stick will generally keep the tongue, or if not, it may be held.)

III. Then open the vest and the outer clothing so as to get nearer to the surface. If at hand, apply ammonia up the nostrils and inject with a hypodermic syringe a dram or teaspoonful of brandy or whisky every few minutes beneath the skin of the upper arm or shoulder, or let another do it while you work on at *artificial* respiration—

THUS: In order to fill the lungs with air, raise both arms slowly upward and backward until the hands are brought together directly over the head. Then, more quickly replace them at the sides.

To expel the air from the lungs:

Place one hand upon the navel and the other close above it; then press heavily upon the navel, at the same time with the other hand or fist push strongly inward and upward, taking off the pressure suddenly. Then repeat the arm movement, and so alternate on and on. One or two persons can do it.

Each time as the arms are drawn back dash hot water against the sides. During these movements some one else should wipe the hair with a towel and put on the head a dry woolen cap; take off the shoes and stockings and wrap the feet in warm flannel and apply the galvanic battery to the feet, thus aiding and yet not interrupting the work of the one in charge, who must be recognized as director.

If still there are no signs of life, *vary the arm movement,* and instead grasp the body around the chest and with the operator's arms under the patient's arm-pits, raise the body forward gently and quickly to a sitting posture, then lay it down again and press over the navel with the hands as before, and alternate by this method about six or eight times per minute and continue according to indications.

The galvanic battery is best applied to the side of the neck and chest walls, but at first, time must not be lost from these systematic efforts to induce artificial respiration. Lose no time, yet do not hurry so as to lose regularity, and do not wait for anything you may want.

Warm rubbing, warmth, ginger tea, hot coffee, champagne or wine, beef tea and egg should be ready for use if there is resusci-

tation and ability to swallow. A portable bed should be at hand so that in transfer to a building there may be no exposure but a recovery of animal heat. As some die in secondary shock after apparent revival, this must be guarded against by quiet, warmth, food and rest.

How to keep the tongue from falling toward the windpipe and so impeding respiration.

Feel with your finger where the tongue is when you put in the pencil or stick and press it down and forward. If you have no one to hold the tongue you need not hesitate to pass a large pin or a small hook through its end, which does no harm and can be passed on through afterward by taking the line off of it. If the stick is passed in at one angle of the mouth across to the back tooth of the opposite side, and raised a little, that pries open the mouth, and the tongue can be worked or pulled well forward or out at the angle of the mouth and held by a handkerchief over the fingers if need be.

How to use the hypodermic syringe.

Remove the nozzle and fill it with brandy or whisky as you would a small syringe. Pinch up the skin and insert horizontally so that it pierces through the skin. Then push the piston down till the barrel of the syringe is emptied of a teaspoonful. A physician may add to the first or second injection the $\frac{1}{50}$ of a grain of digitaline, or six drops of the tincture or three of the fluid extract of digitalis. A drop of the fluid in the syringe should always be forced out before insertion, so as to have no air forced in.

How to use the electric battery.

Have a small Faradic current battery. Mix a little water with a half teaspoonful of the bisulphate of mercury, or, if out of it, use any strong acid, and put it in the metal cup. Then see, by holding the tin handles, one in each hand, that the battery works strongly. Apply one handle closely at the side of the neck and the other at the pit of the stomach. Move the latter handle around and between the ribs of either side and at the ticklish points at each side under the ribs. A battery should be kept at every bathing place. Use it as early as you can. A good hand battery, such as Grenet's, can be had for ten dollars.

TO HOUSEHOLDERS, CITY AUTHORITIES, BOARDS OF HEALTH, ETC.

I. *Look to the Condition of your House.*—Begin at the cellar or basement. Have nothing there that can decay, or that causes foul odors. If damp, let in air or sunlight, or drain the surroundings if needed. If by cleansing, by whitewash or by repeated airing there is not agreeable air, speedily use some of the disinfectants recommended.

II. *Look to the Kitchen.*—Let all sinks be kept sweet by scrubbing—by hot water poured down each day, or by use of disinfectants if needed. If outside there is an opening to the air, so that the kitchen sink is not the chief air outlet to a cesspool or sewer so much the better. Be careful that all slops or offalling from kitchen or laundry work is soon conveyed away, or disinfected at once, and not made to become a part of any heap or mass of impure matter. Cleanness cannot come out of uncleanness. Such things rapidly vitiate air, and discomfort, sickness or death result. Dirty water of any kind is even worse than dry filth. Secure cleanliness if you would secure health.

III. *Have the Dwelling and Sleeping Rooms well aired each day.* Closed closets, unshaken bed clothing, windows open and curtains down will not secure rooms fit to live in, or sleep in. *Flush* the room with air and let this, with sweeping and dusting, remove the organic particles which otherwise constantly accumulate and cause foulness. Chamber slops and wash-water are very innocent if cared for within six hours, but soon after decompose, and in sickness or very hot weather, sometimes sooner. If there are water-closets or stationary wash-basins in your house, be sure that they are not the foul air inlets to outside cesspools or sewers. Have good traps, good outside ventilation, good caution as to smells and use disinfectants for temporary purposes until you can remedy radical defects. Look to unoccupied rooms and the attic so that all may be dried and well aired, and that you may secure as much coolness and ventilation above you as possible, and not have an unventilated hot air chamber near the roof.

IV. *Know as far as you can that your Water and Ice Supply is Pure.*—Use no water from wells where surface soil is foul or where organic matter can reach, or from cisterns exposed to foul

air, as water will absorb foulness. If the water has any odor while heating in a glass tube, or if it becomes turbid or emits odor on being shaken after being kept a day in a long glass bottle, half full and corked, at once suspect it. If you must use it, have it boiled, and when cool, air it by pouring from one pitcher to another, and use it thus until you can be satisfied as to the purity.—See in full our First Annual Report, pages 83-4.

V. *See that the Food supplied for your Family* is in proper condition before cooking, and that it is prepared in a wholesome way.

VI. *Look to the Out Door part of your Home and that it is kept in Proper Order—that no water or decomposing matters are thrown upon it.*

If there is a cesspool it must not smell where it is disconnected with the house or has access to the air. If it does, it must be disinfected until radical change can be made. If there is an ordinary outdoor privy have free access of air to it, and exclusion of all slop or rain-water from it. If there is odor from it, use odorless disinfectants until it is corrected. If too foul for use cover it over with "calx powder," and have under the seats some receptacle, such as the patent pail, or a half barrel, or tub, which can be frequently removed and alternately replaced by another. A privy built above ground, with water-tight receptacle, by the use of dry earth, powdered wood charcoal, dry sifted ashes and occasional copperas water, is easily kept neat and clean, if cleansed each spring and fall.

Country homes need inspection and circumspection. Their sanitary care is often greatly neglected by nice people.

VII. *Insist that your town, if you live in one, have thorough sanitary inspection.*—Where persons are housed closely to each other there cannot but be evils from which the community has a right to be protected, and yet from which each one cannot protect himself. There will be householders who, from thoughtlessness, ignorance or poverty, do not secure for themselves or for others the needed sanitary conditions. Charity, the public welfare, and the necessary incidents of city life require regulated and definite provision against all those nuisances which imperil the life and health of the populace.

Insist upon systematic prevention, instead of waiting for that

loss which disease always involves, when it is artificial, or when we are compelled to meet an epidemic hurriedly.

If your authorities do not act, move by voluntary associations, which shall exhibit the facts and so compel action.

There is no waste so great as that of preventible disease, which disables not only the sufferers, but puts a tax on labor, capital and life much more direful than a well directed expenditure to prevent it. Epidemics are to be dreaded, but our greatest losses are from a chronic death and sickness rate which has a permanent base of supply in prevalent insanitary conditions, not prevented, not remedied as they should be and can be. Public health is common wealth. Can you not do something to reduce the tax levy which forced diseases impose upon the citizens of your city, township and State? To the degree that sickness and invalidism is unnecessary, it means hard times and ill-content. Every motive of comfort and interest requires that we plan to prevent all those ailments which are within the range and duty of our control.

DISINFECTANTS, AND HOW TO USE THEM.

Draughts of air for all floating foulness.

Dry rubbing for all easily detached foulness.

Wiping and water scrubbing for all attached foulness in most cases admit of no effective substitution.

Submersion in boiling water is applicable to the cleansing of all garments, utensils, &c., admitting of such a method; and dry boiling heat or freezing cold will also neutralize infective particles.

To disinfect a room, ship or building so needing disinfection that its contents and surfaces cannot be easily dealt with singly; close the room or building, its windows, doors and chimneys so as to exclude the outer air as far as possible. Vacate the house. Break roll sulphur in small pieces, place it on an iron plate or other metallic dish, and set this on a pair of tongs, or other cross-bar, over an iron pot in which there is water, or over a large box of sand, so as to avoid danger of fire from small particles of burning sulphur. Light it by a few hot coals or some alcohol poured around the sulphur and lighted. Then leave and shut the door after you. A pound and a half of sulphur is sufficient for 1,000 cubic feet of space. The sulphur will convert all the oxygen of

the air into sulphurous acid, and all organic particles are likely to be changed. Keep closed three hours after the burning has ceased, and then air well six hours before occupying. Clothing and bedding needing disinfection may be hung on lines and left in the room. Most furniture is not permanently injured, but needs dry wiping and then washing off afterwards.

Chloride of Lime.—A valuable disinfectant, chiefly because it contains from 30 to 35 per cent. of chlorine, which is liberated under proper methods of use. If purchased for cities, it should be tested as to the amount. It is not overrated as a disinfectant if only its quality is known, and its mode of use is judicious. It needs slight moistening, frequent stirring, and sometimes the addition of an acid, as vinegar or common spirits of salt. The test of its efficiency is that the odor of it be kept constantly perceptible.

Chlorinated Soda.—Usually known as Labarraque's solution, is a convenient liquid preparation, valuable for use in saucers in the sick room or in utensils. Its odor should be perceptible to strangers entering.

Lime—Plaster—Charcoal—Dry Earth—Sifted Ashes.—All these have value, chiefly to be tested by the rapidity with which they correct odors. Fresh slaked lime should be scattered in all places of foul odor. It or charcoal or plaster may be scattered over heaps emitting foul odors. Calx powder is made by pounding one bushel of dry fresh charcoal and two bushels of stone lime, and mixing them, and is of great practical use.

All these substances absorb foul gases and dry up moisture, and so help to retard decomposition, or else absorb its results. Where lump charcoal is used it may be refitted for use by reheating it. Quick lime and ground plaster should not be used where they may be washed into pipes and form lime soap or obstruct by hardening.

The Metallic Disinfectants.—Sulphate of iron (copperas or green vitriol), two pounds to a gallon of water, to be sprinkled freely in drains, cesspools, privy closets, soiled vessels, or heaps of decaying matter which cannot be removed at once. One half of the strength will do where it is to stand in contact with surfaces or in spittoons, water-closets, house vessels or vaults.

One half pound of sulphate of iron (green vitriol), or one ounce of sulphate of zinc (white vitriol), or one ounce of sul-

phate of copper (blue vitriol), or one ounce of chloride of zinc (butter of zinc), or one ounce of chloride of lime (bleaching powder), put to a quart of water—any one of these is available for neutralizing discharges or for sinks, used in quantities sufficient to cover the bulk they are intended to disinfect.

Soiled garments may be put to soak in a half pound of sulphate of zinc (white vitriol), to three gallons of water. It will not stain or discolor most fabrics. One ounce of chloride of lead dissolved in a pint of hot water, and then a pailful of water added, into which a handful of common salt has been thrown, serves a similar purpose. Also a half ounce of permanganate of potash to a gallon of water.

For washing, soiled garments should be put in boiling water, unless the character of the fabric forbids it. Powdered borax, one quarter of a pound to a gallon of water, is a good cleanser of clothing. Soiled hair, brushes, etc., are cleansed by it. Chloride of zinc, one quarter of a pound to a gallon of water, does not stain or discolor fabrics.

Parkes recommends two ounces of chloride of lime, or one ounce of sulphate of zinc, or one half of a fluid ounce of chloride of zinc, to be added to each gallon of the boiling water in which the garments are thrown. On clothing that cannot be washed, and does not need to be burned, after thorough shaking and airing, the sulphate of zinc or chloride of zinc solution may be sprinkled.

For general disinfection, the following compound is available and valuable, and far better than most of the patented articles offered:

Sulphate of iron (copperas), forty pounds.
Sulphate of lime (gypsum or plaster), fifty pounds.
Sulphate of zinc, (white vitriol), seven pounds.
Powdered charcoal, two pounds.

Mix well, and scatter dry or wet it in small quantities, and make into balls ready for use. Where a liquid is needed, stir in water in the proportion of a pound of the powder or ball to a gallon of water, and sprinkle where needed.

Carbolic Acid is valuable as an out-door disinfectant, to be added to the sulphate of iron solution or used separately. Because of its own odor we cannot well test its effect in correcting other smells. We would test specimens or use only Squibbs

Liquid, No. 1, because sure of its strength, to be diluted by adding from fifty to one hundred parts of water, according to the mode of its employment. It is seldom required if the other articles named are properly used. Carbolic acid and chloride of lime must not be used together.

Remember that we do not know that any chemical disinfectants destroy the germs of a disease.

They only neutralize or suspend the action of those artificial disease producers or fertilizers, which the bad administration of cities or householders, or interference with natural laws or neglect of cleanliness has provided. We are to rely on these palliatives or correctives only while we are preparing for radical methods of prevention.

N. B.—The only reason why the death rate of your city or your township is over 15 to the 1000, or why the sickness and invalid rate is a large multiple of this, is because you are the victims of nuisances which admit of abatement.

PRESENT WHOLESALE PRICES OF DISINFECTANTS.

Sulphate of Iron (Copperas, Green Vitriol), 1½ cents per pound.

Sulphate of Zinc (Vitriol), 6 cents.

Chloride of Lime (in bulk), 2 cents per pound; in packages, 6 cents.

Sulphur Roll, 2½ cents per pound.

Carbolic Acid (No. 1 Squibbs), 30 cents per pound.

Zinc and Carbolic Acid, disinfectant of N. Y. Board of Health, 40 cents per gallon.

Permanganate Crystals, $1.10 per pound.

50 per cent. solution Chloride of Zinc, 25 cents per pound.

Solution of Chlorinated Soda (Labarraque's), 10 cents a pound.

SANITARY APPLIANCES.

TRENTON, N. J., May, 1880.

In the practical applications of sanitary science, it has become necessary to use very many appliances, both for convenience and to guard against evils incident to household and city life. These inventions have become far more numerous and useful than is generally known. To afford the people a better opportunity to

become acquainted with their merits, both by personal examination and by the opinions of experts, the State Fair of New Jersey and the State Board of Health last year united in an exhibition of sanitary appliances. Although it was the first of the kind attempted in this country, it was so highly successful as to lead us to make it a permanent and prominent feature at this great annual gathering of our citizens. This fair is held for a week each year, only a few miles from New York City, near Newark, and on the direct route to Philadelphia and to the south and west. The attendance from this and other States is very large, and it affords the best opportunity for familiarizing the people with valuable improvements. It opens this year September 20.

Specimens, models or drawings may be sent either as competing for premiums or for exhibit. Every article should bear a descriptive label, containing detailed information respecting its construction, use, retail price, and the place at which it can be obtained. There is no charge for space. Facilities will be afforded for those who desire to show any apparatus in actual working. Articles must bear the name of the owner or agency exhibiting. The small cost of conveying goods to and from the fair must be borne by the exhibitors. Letters of inquiry may be addressed to E. A. Osborn, C. E., Middletown, N. J., or to State Board of Health, Trenton, N. J. Articles sent for exhibit in our care should be directed "New Jersey State Fair, Waverly. Care of New Jersey State Board of Health."

The State Board of Health has commenced at Trenton, the capital of the State, a museum of sanitary appliances, to which any owner or manufacturer may present the articles exhibited as the property of the State, for permanent examination and exhibit. Or they will, by us, be directed to the persons or agents with whom they are to be left.

ADDITIONAL FOREIGN CIRCULAR.

It is also our desire to secure from foreign inventors and dealers specimens of the most approved appliances. It is the best opportunity that can be afforded in this country for extending their sale. Already the foreign press has noticed some valuable features of our last exhibit. No pains will be spared to do full justice to each article sent. Any article donated will be placed in the Museum or disposed of as otherwise ordered. Persons wishing to establish agencies in this country will be directed to

responsible agents, who can furnish full reference. Any articles sent to our care, as herewith directed, may be consigned through Morris' express, 50 Broadway, New York, or through other agents. Expenses of transfer from the New York agency to the fair grounds will be paid for here. We can assure exhibitors of careful attention to the merits of each article.

By order of the State Board of Health.

EZRA M. HUNT, M. D., *Sec'y.*

☞ Note.—The N. J. Express Co. delivers goods on the grounds.

OFFICE OF N. J. STATE AGRICULTURAL SOCIETY,

No. 764 BROAD STREET, NEWARK, N. J., May, 188 .

The Sanitary Exhibit of the New Jersey State Agricultural Society, which holds its Annual Fair at Waverly Park, on Pennsylvania Railroad, between Newark and Elizabeth, September will be under the superintendence of the New Jersey State Board of Health. In addition to the catalogue premiums in classes, we will also confer decorative medals for the best exhibit in each of the following groups:

1st. Ventilating and Smoke-consuming Appliances.

2d. Water-supply Apparatus, Filters, Sanitary Conveniences and Disinfectants.

3d. Sewage Conductors and Receptacles, Tanks, Cesspools, &c.

4th. Water-closet and Emptying Apparatus.

5th. Life and Labor-saving Apparatus.

A suitable building, supplied with water, is provided, and the actual working of ventilators and various other appliances can be shown.

It is intended to make this exhibit an attraction at our Annual Fairs, so that all may become acquainted with the best sanitary arrangements, and inventors and dealers have a good opportunity for comparing and testing apparatus. When necessary the Judges will order trial, and postpone award until satisfied.

WM. M. FORCE, Rec. Sec.	AMOS CLARK, JR., Pres't.
E. M. HUNT, M. D.	E. A. OSBORN, C. E.
A. D. NEWELL, M. D.	W. M. FORCE.
E. DUNN.	J. C. BAYLES.

PHINEAS JONES.

☞ Note—The N. J. Express Co. delivers goods on the grounds.

LAW AS TO BOARDS OF HEALTH, VITAL STATISTICS, &c.

An act entitled "An act concerning the protection of the public health and the record of vital facts and statistics relating thereto."

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That every city or borough or incorporated town, or any town governed by a commission, shall have a board of health of not less than five or more than seven members, of which the keeper or recorder of vital statistics, and also one city physician and city health inspector shall be members, if there be such officer or officers; and the said board of health shall be nominated by the mayor and approved by the common council or other governing board of the city, borough or town, to serve for not less than three years, but not more than three of the number shall go out of office at any one time, unless in case of removal by death or change of residence.

2. And be it enacted, That all cities of over ten thousand inhabitants shall have one or more city health inspectors, who hereafter in any new board, or in any case of vacancy, shall be appointed by the board of health.

3. And be it enacted, That in each township of the state outside of city limits, the township committee, together with the assessor and the township physician, if there be such an officer, shall constitute the board of health for all of said township outside of any city limits, and shall have the same powers as are possessed by any city board of health within the state, so far as they could relate to any unincorporated district.

4. And be it enacted, That every local board of health of any city, borough, town or township shall, on or about the first of October of each year, in addition to any other reports that the local authorities may require, prepare an annual report of the condition of the public health in their district, stating, also, any special causes of deterioration of health or hazard thereto, and shall therein answer any inquiries which have been addressed to them by the state board of health; in the case of cities the same shall be presented to the city authorities, and the board of health shall, on or before October fifteenth of each year, forward a copy

of the same to the address of the state board of health at Trenton; and in the case of townships, a similar report, signed by the chairman of the township committee, shall, by the same date, be sent as herein provided for city boards.

5. And be it enacted, That boards of health of cities or townships or any county health board shall, through the keeper or recorder of vital statistics, take cognizance of any neglect of returns on the part of any persons charged with this duty under the laws of this state, and are authorized to pass ordinances additional thereto, and not conflicting with the same; and they shall have the same powers of action for neglect as is given to the state board of health, and in addition, in the case of the failure of any city clerk, assessor or physician to make full returns as required by law, may bring action for the same and recover for the use of said city or township to the amount not exceeding fifty dollars; and in case of the death or removal of any assessor before the time for electing a successor, the township clerk shall take charge of and report such returns until the election of an assessor.

6. And be it enacted, That the state board of health, in making inquiries and investigations in regard to the causes of disease and mortality and the modes of their limitation, may aid any local board to the amount of twenty dollars in any one year, and that for this purpose, and also for extending its own inquiries into the sources of physical deterioration or local causes of disease, the board be authorized to expend two thousand dollars each year, in addition to the amount heretofore provided, said expenditure to be accounted for each year by itemized bills, audited by the president and secretary of the board of health and approved by the governor, and then shall be paid as other accounts of said board.

7. And be it enacted, that the board of health of any borough, incorporated town or township, shall examine into all nuisances, foul or noxious odors, gases or vapors, or causes of ill health or disease that may be known to them or certified to them by three or more freeholders or tenants, as in their opinion injurious to the health of the inhabitants within their township, or in any such vessel within any harbor or port of such city, borough, town or township, and shall deal with the same as in the manner herewith directed, to wit: whenever such nuisance or

source of noxious odors, or cause of ill health or disease, shall be found on public property or on the highway, the person or persons officially in charge thereof as overseers, civil officers, directors or trustees, shall be notified to cause the same to be removed as the case may require; and if failing so to do the procedure shall be the same as hereinafter provided in the case of private individuals.

8. And be it enacted, That whenever such nuisance, source of foulness or cause of sickness hazardous to the public health, shall be found on private property, that the board of health of the city, town or township in whose limits it may be, shall at once notify the owner at his own expense to remove the same within such time as said board shall deem the public health to require, a duplicate copy of the notification being also left with one or more of the tenants or occupants; if the owner resides out of the state and cannot be reached with notice speedily enough for the necessities of the public health, a notice left at the house with the tenant shall suffice; if the owner thus notified shall not comply with such notification or order of the local board of health within the time therein specified, said board shall proceed to remove said nuisance, source of foulness, or cause of sickness hazardous to the public health, and all expenses incurred thereby shall be a lien upon the property of the owner of the real estate or building on which the nuisance has occurred, for which he may have action against any person or persons who have caused or allowed said nuisance; and it is also provided that the property owner shall have the right under his notification, of speedy reference to the state or county board of health acting in a body or through its executive officer, within such time as the local board of health shall on his application direct, unless in its judgment the danger to the public health is too immediate to admit of delay; and in case any injunction or stay of proceedings in any form is applied for, such injunction or stay of proceedings shall not be issued until the local board and the state board have been notified to appear and be present at such hearing; but the failure of the owner to cause removal, or the refusal of the court applied to, to grant a stay of proceedings, shall not prevent the party or parties making the application from any suit at law and recovery of damages, if the alleged

nuisance be shown to have been in no way hazardous or prejudicial to the public health.

9. And be it enacted, That in order to secure the preparation of such tabular classification and deductions therefrom as bear upon political economy, population, the causes of disease and of epidemics at the time of indexing the records of marriages, births and deaths, there shall also be made a full transcription of such vital facts as are required for such purposes, and the allowance toward such transcription, and for the indexing of the records, shall be five cents for each return, payable in the same way as heretofore provided for the index record but the amount to be paid to the registrar or others for this clerical service, shall be determined by the state board of health, and the medical superintendent shall render to the secretary of state and to said board yearly an exact statement of the whole amount thus received and how expended, and the balance, if any remaining, shall be paid over to the state board of health and its expenditure accounted for through account audited by the president of said board and approved by the governor.

10. And be it enacted, That at the enrollment of the children each year by the clerks of district schools or by other proper officers in cities, inquiry shall be made as to how many of the children within the school age are unvaccinated, and the same shall be designated by a mark on said roll, and in the case of any found unvaccinated whose parents desire them to be protected from small-pox, but who, in the judgment of the board of education or the trustees of the school district, are not able to pay therefor, the school clerk or other authorized person may give to said child or children a permit to appear at the office of any regularly licensed physician of said school district or of said township to be vaccinated, and any such physician, on the presentation of such permit, with his certificate appended thereto that the said vaccination has been by him successfully performed, shall be entitled to receive from the township committee or city treasurer fifty cents for every such certified case.

11. And be it enacted, That in case of any county having a county board of health or vital statistics, nothing in this bill shall change or modify their former power or jurisdiction and they shall possess all the authority herein granted to city or township boards; and they shall yearly report to the state board

of health as to the cities and townships of the county, in the same way as is required in counties where there is no county board of health; they shall be the sole power to make ordinances in relation to the public health and to carry out the provisions of the laws of this state in reference to the registration and returns of vital statistics, in their respective counties nothing in this act shall relate to or effect any boards of health now organized in any of the cities of this state under the provisions of their respective charters.

12. And be it enacted, That this act shall take effect on the first day of April, one thousand eight hundred and eighty.

Approved March 11th, 1880.

EXPLANATORY CIRCULAR TO CITIES AND TOWNSHIPS.

April 1st, 1880.

The recent Legislature passed some acts which have important bearing upon the care of the public health. We shall quote such parts and sections as require early attention on the part of communities.

I. " An act concerning the protection of the public health, and the record of vital facts and statistics relating thereto."

Sections one and two are as follows:

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That every city, or borough or incorporated town, or any town governed by a commission, shall have a board of health of not less than five or more than seven members, of which the keeper or recorder of vital statistics, and also one city physician and city health inspector shall be members, if there be such officers; and the said board of health shall be nominated by the mayor and approved by the common council or other governing board of the city, borough or town, to serve for not less than three years, but not more than three of the number shall go out of office at any one time, unless in case of removal by death or change of residence.

2. And be it enacted, That all cities of over ten thousand inhabitant shall have one or more city health inspectors, who

hereafter in any new board, or in any case of vacancy, shall be appointed by the board of health.

These two sections are afterwards limited so as not to compel any city that already has a Board of Health, organized according to a mode prescribed in its charter, to be changed. But it is mandatory as to all others, and also as to those cities which have nominal Boards of Health or Health Committees, whose mode of construction is not specified in their charters. An Inspector is required in all cities of over ten thousand inhabitants. It is also desirable that those cities which, by their charters, have the construction of their Boards of Health defined, should conform to the general method and spirit of this law as far as their charters permit.

Sections three and four are as follows:

3. And be it enacted, That in each township of the state outside the city limits, the township committee, together with the assessor and the township physician, if there be such an officer, shall constitute the board of health for all such townships outside of any city limits, and shall have the same powers as are possessed by any city board of health within the state, so far as the same could relate to any unincorporated district.

4 And be it enacted, That every local Board of health of any city, borough, town or township shall, on or about the first of October of each year, in addition to any other reports that the local authorities may require, prepare an annual report of the condition of the public health in their district, stating, also, any special causes of deterioration of health or hazard thereto, and shall therein answer any inquiries which have been addressed to them by the state board of health; in the case of cities the same shall be presented to the city authorities, and the board of health shall, on or before October fifteenth of each year, forward a copy of the same to the address of the State Board of Health at Trenton; and in the case of townships, a similar report signed by the chairman of the township committee, shall, by the same date, be sent as herein provided for city boards.

Under this law the township committee, the assessor, and the township physician, if there be one, are directed soon after April first, to organize as a Board of Health. They will then please notify this Board of the Post Office address of each member. In the meantime we shall send a Township Health Book to each

assessor for the use of such Township Board. Cities should have a similar Health Book. The general duties of the Board are to guard against preventable causes of disease, and to seek to prevent the spread of disease. The Town Health Book should be kept by one of the members. Generally either the assessor or township physician have most correspondence with the State Board and the Bureau of Vital Statistics.

On the first page of the Health Book give name of township, its number of square miles, its population by the census of 1880, white and colored, male and female, number under twenty-one, and number between school ages if possible. Repeat each year as far as necessary.

Any prevalent sickness, such as periodic or malarial fevers, whooping cough, etc., should be noted, even if few or no deaths have occurred therefrom. Also any prevalent diseases among animals and their fatality.

The condition of school-houses or other public buildings should be noted.

Where there are villages in the township, special note should be made of any insanitary conditions.

Any cases of complaints of nuisances or evils injurious to health should be recorded, together with the action of the Health Board thereupon.

A copy of the report made each year to the State Board of Health should be transcribed. As the State Record of Marriages, Births and Deaths extends from July first of each year, the yearly entry thereof should begin with that date. For convenience of comparison, some prefer to divide it into two periods of six months each.

The report sent yearly to the State Board of Health should also relate to the period from July to July, with an appended note at the close as to anything very special in the three months just preceding the report.

Food or fruit production may be briefly noted, as bearing on health condition. All such brief data are very valuable for after study as well as for present knowledge.

The following is a schedule of some of the subjects as to which reference and report are needed:

SCHEDULE.

A. Location, population and climate.
B. Geology, topography and contour.
C. Water-supply.
D. Drainage and sewerage.
E. Streets and public grounds.
F. Houses and their tenancy.
G. Modes of lighting.
H. Refuse and excreta, (how managed.)
I. Markets.
J. Diseases of animals.
K. Slaughter-houses and abattoirs.
L. Manufactories and trades.
M. Schools and school and other public buildings.
N. Alms-house, hospitals and other charities.
O. Police and prisons.
P. Fire guards.
Q. Cemeteries and burial.
R. Public health laws and regulations.
S. Registration and vital statistics.
T. Quarantine or care over contagious diseases.
U. Sanitary expenses.
V. Heat and ventilation for dwellings.
W. Diseases of the year.

It is well to keep a yearly record of temperature and rain and snow fall, such as this:

Table of Temperature and Rainfall at————, from January 1, 18—, to December 31, 18—, by————.

MONTHS.	Minimum Temperature.		Maximum Temperature.		Mean temperature of month.	Fair on days.	Snow on days.	Rain on days.	Total rain and melted snow. (Inches.)	Monthly mean of rain and melted snow in previous five years.
	Date.	Degree.	Date.	Degree.						
January	8	9.50	23	48.25	31.00	18	3	11	6.445	3.812
February	4	8.00	28	55.75	33.24	16	2	8	4.960	3.392
March	28	17.25	10	67.00	45.16	18	3	13	3.035	4.958
April	6	40.00	21	78.50	55.55	15	0	8	1.730	4.823
May	14	39.00	26	85.00	60.73	21	0	9	4.205	2.433
June	6	48.75	30	98.25	68.20	18	0	8	2.446	2.677
July	23	61.50	3	98.25	78.25	18	0	11	4.330	5.172
August	26	55.00	9	90.50	73.09	17	0	10	8.060	6.189
September	28	43.75	1-2	88.00	67.47	17	0	10	2.535	4.701
October	29	35.00	2	76.75	56.41	23	0	8	2.823	3.628
November	15	27.00	12	58.00	42.65	18	2	9	4.570	4.569
December	25	13.50	1	57.75	31.83	20	6	7	7.459	2.265
Means and Totals	Feb. 4.	8.00	July 3.	98.25	53.63	219	18	110	54.363	....
Previous five years	Jan. 4, 1873.	12.00	July 26, 1877	99.00	50.48	227	30	97	48.499	....

Thermometers in the shade, having a northern exposure, protected from reflection.

Thus the coldest and hottest days, and the mean temperature for the year and for a series of years is easily referred to.

The Board should meet in April and the last of September, and as much oftener as needed on the call of the chairman.

The first report to the State Board of Health, in October, should give items as to most of the schedule subjects, and a full idea of present conditions. Afterwards, from year to year, each subject may be presented in its due proportion of importance. Either the township physician or some other medical man will prepare or aid in the outline.

Section five is as follows:

5. And be it enacted, That boards of health of cities or townships or any county health board shall, through the keeper or recorder of vital statistics, take cognizance of any neglect of returns on the part of any persons charged with this duty under the laws of this State, and are authorized to pass ordinances additional thereto, and not conflicting with the same; and they shall have the same powers of action for neglect as is given to the state board of health, and in addition, in the case of the failure of any city clerk, assessor or physician to make full returns as required by law, may bring action for the same and recover for the use of said city or township to the amount not exceeding fifty dollars; and in case of the death or removal of any assessor before the time for electing a successor, the township clerk shall take charge of and report such returns until the election of an assessor.

Localities should not only secure general returns of vital statistics, but, from year to year, study deaths and the causes of deaths in certain localities, and obtain information as to healthy and unhealthy situations. When the figures are entered side by side for five years or more, they often guide in identifying local evils.

The Health Board must now see to it that ministers, physicians, etc., do not neglect a duty which is a part of their service. The law passed this year exempting physicians from jury duty more than compensates for the time and trouble.

Section six is as follows:

6. And be it enacted, That the state board of health, in making inquiries and investigations in regard to the causes of disease and mortality and the modes of their limitation, may aid any local board to the amount of twenty dollars in any one year, and that for this purpose, and also for extending its own inquiries

into the sources of physical deterioration or local causes of disease, the board be authorized to expend two thousand dollars each year, in addition to the amount heretofore provided, said expenditure to be accounted for each year by itemized bills, audited by the president and secretary of the board of health and approved by the governor, and then shall be paid as other accounts of said board.

This section appropriates two thousand dollars, part of which we may use in organizing these Boards. With this fact and the number of townships in view, we shall be able this year to pay to each Board such sum under ten dollars as is actually expended by them. The bill of expenditure must be certified by the assessor and the chairman of the township committee. It is believed that in each township the Board of Health thus constituted may meet at the time of the transaction of other business, and will need to expend but little, except where special cases recognized by the town committee, or complaints, may require attention. In such cases the public benefits far outweigh slight expense. The State Board of Health, as a body, has only its actual expenses paid, and these local Boards can do much on the same basis, with such special provision for any special service. The time has come when population must be cared for as a great material resource and as a part of our prosperity. Small villages and country districts often have their local nuisances or cases of spreading contagions, and there is need of some authority to which to appeal. It is as unprofitable as it is afflictive to have localities suffer from diseases or nuisances which are within the range and duty of local control. The Board hopes that careful attention will be given to concise yearly records in the Town Health Book, and will expect every three or five years by an examination of all these records, as well as from the annual reports transmitted, to secure valuable facts as to the care of health, the prevention of diseases and pauperism, and the promotion of public welfare.

Sections seven and eight are as follows:

7. And be it enacted, That the board of health of any city, borough, incorporated town or township, shall examine into all nuisances, foul or noxious odors, gases or vapors, or causes of ill health or disease that may be known to them or certified to them by three or more freeholders or tenants, as in their opinion

injurious to the health of the inhabitants within their township, or in any such vessel within any harbor or port of such city, borough, town or township, and shall deal with the same as in the manner herewith directed, to wit: whenever such nuisance or source of noxious odors, or cause of ill health or disease, shall be found on public property, or on the highway, the person or persons officially in charge thereof as overseers, civil officers, directors or trustees, shall be notified to cause the same to be removed as the case may require; and if failing so to do the procedure shall be the same as hereinafter provided in the case of private individuals.

8. And be it enacted, That whenever such nuisance, source of foulness or cause of sickness hazardous to the public health, shall be found on private property, that the board of health of the city, town or township in whose limits it may be, shall at once notify the owner at his own expense to remove the same within such time as said board shall deem the public health to require, a duplicate copy of the notification being also left with one or more of the tenants or occupants; if the owner resides out of the state and cannot be reached with notice speedily enough for the necessities of the public health, a notice left at the house with the tenant shall suffice; if the owner thus notified shall not comply with such notification or order of the local board of health within the time therein specified, said board shall proceed to remove said nuisance, source of foulness, or cause of sickness hazardous to the public health, and all expenses incurred thereby, shall be a lien upon the property of the owner of the real estate or building on which the nuisance has occurred, for which he may have action against any person or persons who have caused or allowed said nuisance; and it is also provided, that the property owner shall have the right under his notification, of speedy reference to the state or county board of health, acting in a body or through its executive officer, within such time as the local board of health shall on his application direct, unless in its judgment the danger to the public health is too immediate to admit of delay; and in case any injunction or stay of proceedings in any form is applied for, such injunction or stay of proceedings shall not be issued until the local board and the state board have been notified to appear and be present at such hearing; but the failure of the owner to cause removal,

or the refusal of the court applied to to grant a stay of proceedings, shall not prevent the party or parties making the application from any suit at law and recovery of damages, if the alleged nuisance be shown to have been in no way hazardous or prejudicial to the public health.

These sections are in accord with the highest legal advice as to methods, and can be carried out when the public safety demands. Some one member of the Township Board of Health may be recognized as its chief executive officer, to act for the Board by their authority. Those seeking the removal of nuisances will often aid in preventing unnecessary expense.

Section ten is as follows:

10. And be it enacted, That at the enrollment of the children each year by the clerk of district schools or by other proper officers in cities, inquiry shall be made as to how many of the children within the school age are unvaccinated, and the same shall be designated by a mark on said roll, and in the case of any found unvaccinated whose parents desire them to be protected from small-pox, but who, in the judgment of the board of education or the trustees of the school district, are not able to pay therefor, the school clerk or other authorized person may give to said child or children a permit to appear at the office of any regularly licensed physician of said school district, or of said township, to be vaccinated, and any such physician, on the presentation of such permit, with his certificate appended thereto that the said vaccination has been by him successfully performed, shall be entitled to receive from the township committee fifty cents for every such certified case.

This section extends to the poor the privilege of vaccination, and thus relieves them from an exposure which might not be culpable on their part. Incorporated cities are only exempted from these provisions if they have municipal charters which have similar and generally far more mandatory powers. These will also make yearly reports to the State Board of Health. Thus, being in possession of vital statistics, and of brief health reports from every part of the State, we shall be able to make such a summary as will exhibit the actual health condition of our population. Thus we may know how to deal with, and abate evils whether general or special, and to compare each part with the other. The general health condition of each township and city needs this supervision.

Besides these general health provisions, Hudson county and some of our cities have secured larger powers for abating localized evils. Authority to deal with epidemics as found among animals has been given to this Board. A law has also been passed, which, while not intended to endorse the medical diplomas of the many poor medical schools, will help to restrict the malpractice of those who are dealing with serious diseases, without the least evidence of any acquired skill and competency.

This Board now, more fully than ever before, invites the co-operation of every municipal and township Health Board. Believing in the local execution of sanitary laws by local authorities, it only insists upon such uniformity as is necessary for co-operative State interest, and such as has received the sanction of the best medico-legal sanitarians. The highest results of social life and health care can only be secured by a central bureau to collect, collate and advise, and by such strict and co-ordinate administration in each city and district as both general and local interests demand. The organization is now imperative, but ordinances and their execution depend on localities. We ask the mayors and city clerks of cities, and the assessor or township physician of each township, to at once call together the persons designated in this act, and communicate the names to us.

Each Health Board should carefully preserve the yearly reports of the New Jersey State Board of Health, which will be sent to the assessors and city clerks for this purpose. The three already published can be had of the assessors. The Third Report is especially needed, as containing the circulars thus far issued, and former laws that have been passed. So soon as three or four are obtained they should be bound, so as not to be mislaid.

All inquiries or communications should be addressed, State Board of Health, Trenton, N. J.

By order of the Board.

EZRA M. HUNT,

Sec. of State Board of Health and Med. Sup't of State Vital Statistics.

Note.—This circular was placed in each Township Book furnished. Any modifications in the law will be reported from time to time. It is requested that Boards of Health, in addition to securing accurate returns of vital statistics, shall in their annual reports, state the prevalence of any disease during the year—the number of cases as accurately as possible.

CIRCULAR TO LOCAL BOARDS OF HEALTH.

TRENTON, September 15th, 1880.

GENTLEMEN:—A report from your Board of Health to October 1st, will be expected to be sent to the office of the Board, State House, Trenton, if possible, by October 15th, and not later than November 1st.

Important facts and statements will be embodied in the State report, and the whole will be kept on file for future reference as to the conditions of public health in all localities of the State.

We have already become aware of important work done by many of these boards. Others, because of locality or tardiness in organization, or because members have failed in comprehending the work to be done, have merely organized.

The few that have failed to organize must immediately do so, and report to us the names and address of the members.

The period since the law went into operation is so brief, that this year we only seek correspondingly brief reports on such of the topics referred to on the printed page of the book that was sent, as may have come under the consideration of the Board. In cities and the more populous districts, it is well to follow the order of the book schedule, A, B, C, etc., in the order there presented.

The report of the State Board, for this year, will contain suggestions as to the work of local boards.

All inquiries should be addressed State Board of Health, Trenton, N. J.

ANNUAL REPORT

Of the Local Board of Health of (city or township)..................
county of...................................for the year ending October 1st, 188

NAMES AND POST OFFICE ADDRESS OF MEMBERS.

....

....

SCHEDULE OF SUBJECTS FOR REPORT.

A. Location, population and climate.
B. Geology, topography and contour.
C. Water-supply.
D. Drainage and sewerage.
E. Streets and public grounds.
F. Houses and their tenancy.
G. Modes of lighting.
H. Refuse and excreta, (how managed.)
I. Markets.
J. Diseases of animals.
K. Slaughter-houses and abattoirs.
L. Manufactories and trades.
M. Schools and school and other public buildings.
N. Alms-house hospitals, and other charities.
O. Police and prisons.
P. Fire guards.
Q. Cemeteries and burial.
R. Public health laws and regulations.
S. Registration and vital statistics.
T. Quarantine or care over *contagious* diseases and vaccination.
U. Sanitary expenses.
V. Heat and ventilation for dwellings.

Other subjects may be named under W, X, Y, Z. The subjects may thus be referred to by the letters.

If the sheet provided is not sufficient, add others, marked with the letters which designate the topic treated.

Under W, give all facts as to diseases which have occurred the past year.

A.

B.

"AN ACT TO REGULATE THE PRACTICE OF MEDICINE AND SURGERY."

TRENTON, June 1, 1880.

Copy of a law passed by the Legislature of 1880, entitled "An act to regulate the practice of Medicine and Surgery."

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That every person practicing medicine or surgery in this state in any of their branches for gain, or who shall receive or accept for his or her services any fee or reward either directly or indirectly, shall be a graduate of some legally chartered medical college or university in good standing, or some medical society having power by law to grant diplomas; and such person before entering upon said practice shall deposit a copy of his or her diploma with the clerk of the county in which he or she may sojourn or reside, and shall pay said clerk ten cents for filing the same in his office; said copy to be a matter of record, and open to public inspection.

2. And be it enacted, That any person who shall practice med-

icine or surgery, without conforming to the requirements of the first section of this act, shall be deemed guilty of a misdemeanor, and on conviction, shall be punished by a fine of twenty-five dollars for each prescription made or operation performed, said fine to be sued for and recovered in an action of debt, by any person who will sue for the same, and in default of payment of said fine, the offender shall be imprisoned in the county jail for a period of not less then three, nor more than six months; *provided always*, that he or she may be liberated at any time by paying the amount of said fine and costs.

3. And be it enacted, That it shall be unlawful for any person not qualified according to the first section of this act, to collect any fees for medical or surgical services.

4. And be it enacted, That any person who shall offer for record a copy of any diploma which shall have been issued to any other person, or a diploma issued or obtained fraudulently, shall be deemed guilty of a high misdemeanor, and on conviction thereof, shall be punished by a fine of not less than three hundred dollars, nor more than five hundred dollars, or imprisonment at hard labor for not less than one nor more than three years, or both at the discretion of the court.

5. And be it enacted, That nothing in this act shall be so construed as to prevent any physician or surgeon in good standing, and legally qualified to practice medicine or surgery in the state in which he or she resides, from practicing in this state, but all persons opening any office, or appointing any place where he or she may meet patients, or receive calls, shall be deemed a sojourner in this state, and shall conform to the first section of this act.

6. And be it enacted, That this act shall take effect on the first day of June, one thousand eight hundred and eighty.

This law did not emanate from the State Board of Health, but its bearing on the public health is such that we send a copy to local boards and to physicians. It has been sought by the people and by practitioners of the different schools who concur in the view that no one should be allowed to announce himself or herself as a doctor of medicine, who can not show some evidence of such kind of instruction as is indispensable in the attempt to treat human diseases. While this does not assert the competency

of all having diplomas, since some of our medical colleges are not strict enough, it makes a good approach to protection and gives the best legal assurance now available. Under such a provision three thousand unauthorized practitioners in the State of Illinois have ceased to impose upon the public.

Every local board of health and every general or local medical society in the State should now see to it, that in such township and city the diploma or medical license of any person who claims to be a doctor in medicine and surgery is put on record. [The diploma is not required to be translated.] Unless local authorities attend to this the law might be neglected. If they do, it will soon appear who are authorized practitioners in this State. It will also assist to ascertain from whence come the purchased diplomas which are sometimes found in the hands of authorized practitioners.

Those who already have their diplomas or medical license on record in the county in which they reside, need only to look it up and re-enter it, as on file.

If any person claims to have lost his diploma or certificate of license, the law makes no provision therefor, but if such person will send a statement of the fact, and of the institution and date of graduation to the county clerk, it will, we believe, serve as protection from penalty for breach of the law, until the letter can be fulfilled, or provision made for such special cases. County clerks need to see the original diploma, and compare it with, the copy offered, and enter that fact on the back of the copy or else take the affidavit of the person offering it.

CONTAGIOUS DISEASES OF ANIMALS.

A supplement to an act entitled "An act to establish a state board of health," approved March ninth, one thousand eight hundred and seventy-seven.

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That in addition to the powers conferred by the act to which this is a supplement, said board shall have full power and authority to examine and determine whether pleuro-pneumonia, rinderpest, or any other contagious or infectious disease exist among animals in any county in this state; and that

the sum of five hundred dollars is hereby appropriated to defray the actual necessary expenses of said board while making such examinations.

2. And be it enacted, That in the event of any contagious or infectious disease as aforesaid, breaking out or being suspected to exist in any locality in this state, it shall be the duty of all persons owning or having any interest whatever in said cattle, immediately to notify the said board of health, or any one of them, of the existence of such disease, and thereupon it shall be the duty of said board of health, or any member thereof, to immediately proceed to the place or places where said disease is reported to exist, and to quarantine said animal or animals, and take such precautionary measures as shall be deemed necessary; to prescribe such remedies as in their judgment will be conducive to the recovery of such animal or animals, and to enforce such regulations as may be adopted by said board of health.

3. And be it enacted, That the board of health aforesaid, and all such assistants as they may appoint, whenever in their judgment or discretion it shall appear in any case that the disease is not likely to yield to any remedial treatment, or whenever it shall seem that the cost or worth of any such remedial treatment shall be greater than the value of any animal or animals so afflicted, or whenever in any case such disease shall threaten its spread to other animals, to cause the same to be immediately slaughtered, and their remains to be buried not less than four feet under ground, and all places in which said animals shall have been kept to be cleansed and disinfected.

4. And be it enacted, That in all cases where animals afflicted with, or which shall have been exposed, shall have been slaughtered or killed by the order of the said board of health, or their assistants, it shall be the duty of said board to appoint three competent and disinterested freeholders to appraise the value of the animals so killed or slaughtered, at the time they were so killed; who shall be affirmed, or sworn before proceeding to act, to make a just and true valuation of said animals so killed, at the time of their slaughter, two-thirds of which valuation or appraisement shall be paid to the owner or owners by the state.

5. And be it enacted, That any person or persons refusing or neglecting to notify said board of health, or any of them, of the existence of pleuro-pneumonia, rinderpest, or any other contag-

ious or infectious disease among cattle, shall be deemed and adjudged guilty of a misdemeanor, and upon conviction shall be punished by a fine of not more than two hundred dollars, or by imprisonment not exceeding one year, or both, at the discretion of the court.

6. And be it enacted, That all bills for money expended under this act shall be audited by the comptroller of this state and then submitted to the governor for his approval and after being thus audited and approved by the governor, shall be paid by the state treasurer upon warrant of the comptroller.

7. And be it enacted, That said board shall keep a full record of their proceedings and shall publish the same in the annual report of the state board of agriculture, yearly, and every year during the existence of this law.

8. And be it enacted, That if any person or persons shall knowingly either buy or sell or cause to be bought or sold any animal or animals affected with pleuro-pneumonia, rinderpest or any other contagious or infectious disease, all such person or persons shall be deemed and adjudged guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine not exceeding two hundred dollars or imprisonment not exceeding one year, or both, at the discretion of the court.

9. And be it enacted, That in case an emergency shall arise and a larger sum shall be deemed necessary, than the amount appropriated by the preceding sections of this act, said state board of health shall present the facts in evidence to the president of the state agricultural society, and the president and executive committee of the state board of agriculture, who shall authorize such additional expenditure as in their judgment they may deem the exigency of the occasion to demand; provided that in no case shall the amount of money thus authorized to be expended exceed the sum of five thousand dollars in any one year.

10. And be it enacted, That all acts and parts of acts inconsistent with this act be and the same are hereby repealed, and that this act take effect immediately.

Approved March 12, 1880.

TO FARMERS AND DEALERS IN STOCK.

CIRCULAR A.

The act of 1877, constituting a State Board of Health, made it the duty of this Board "to make inquiries and reports in reference to diseases affecting animals and the methods of prevention." An act of the present Legislature gives additional power in reference to pleuro-pneumonia or other contagious diseases affecting animals. The State Board of Health directs this circular to be distributed.

The legislation of this State as to the diseases of animals, only has reference to preventing the spread of infectious or contagious diseases. When animals are seriously sick from any cause, the owner should make his own arrangements for *skillful treatment.* But when any infectious or contagious disease so far prevails as to threaten to become epidemic, the results which may accrue to citizens at large are so serious, that all governments recognize the right to investigate for the prevention or limitation, and to enact such restrictions as those skilled in the management of epidemics may advise. This State has now placed this oversight within the jurisdiction of the State Board of Health, and thus imitates the custom of other countries.

PLEURO-PNEUMONIA.

The chief infectious malady which has been considered as existing in this State is *Pleuro-Pneumonia.* It may be called lung-plague, but not cattle-plague, since the latter is the name for the very different disease, Rinderpest. That the disease is one which inclines to spread, is agreed by all authorities. Its very threatening justifies the expenditure of such an amount of money as may be necessary to determine its character and its extent. When discovered much depends on the severity of the type or the disposition it has shown to become epidemic.

It is not generally claimed that it ever occurs any more than small-pox, except as it is transported from some previous case. This Board will at first seek to determine where infectious pleuro-pneumonia now exists. With a rigid regard to the trouble of quarantine, it will only exercise the power when the rights of

the people require it. Such action, however annoying to the owner, is in his real interest. We propose not to give orders rashly; to enforce them when given.

Our trade, food supply and stock interests will be greatly aided when, as we trust will soon be the case, we can free each owner from any suspicion of the disease among his cattle.

General Le Duc, the Commissioner of Agriculture, responds at once to our request for an active co-operation with us in stamping out this disease where it exists, and in settling, by expert aid, the question of its extent. In this, too, we are to have the counsel and support of the Executive Committee of the Board of Agriculture. A rapid sanitary inspection will at once be instituted at all places where it has recently prevailed. It is the duty of any owner having cause to suspect such a disease to send us notice.

The attack usually begins with coldness, and dry, hacking cough, with symptoms of pain and uneasiness. The animal refuses food. Milch cows diminish in milk. Even an unskilled man knocking with the fingers against the opposite sides,back of the shoulders, will detect the difference in sound of the two sides.

Both the fever and heat are marked. Many of the symptoms correspond with pleurisy or pneumonia in man—with the same varied severity, and with either acute or chronic symptoms. If new cattle have come into the herd, or if the disease is prevalent near by, there is more ground for suspicion.

The owner must exercise close watch and honestly seek to know whether there is ground to suspect infection. In disputed cases the only way is to consent to submit it to skilled examination and inquiry, and not to make a positive diagnosis in matters in which the owner cannot expect himself to be fully competent.

On March 15th the Secretary of this Board made a visit to a farm on the Delaware, opposite the New Jersey border, in order to examine into the symptoms of the disease, and to compare it with other lung diseases in man or animals. The account of the farmer was that three months previous he bought a cow which, a few days after, sickened and died. He has since lost twelve. His own account, and that of adjoining farmers, would, we think, satisfy most that the disease is infectious pleuro-pneumonia. The United States Veterinary Surgeon, the State Inspec-

tor of Pennsylvania, and other recognized authorities were present, by appointment. Physical examination of four animals showed each with one lung consolidated; three had been sick less than one week and one four weeks. Post-mortem examinations fully verified the diagnosis. The lungs were found increased from about two and a half to twenty pounds, with such changes as are now being microscopically examined. A cow had died of the same disease three days before at Camden. There can be no doubt that it exists more or less in this State, and still more in Pennsylvania and Maryland, from which its ingress must be guarded.

It is strongly in the interest of the farmers and stock dealers of this State in every way to meet the facts and aid us in a speedy riddance of the malady. We propose to act in concert with them for the public welfare. There can be but one conclusion after due examination had—where the disease is found to exist, we must either isolate or quarantine, or give notice to others of the place where it exists, or notify the owner that he will be held accountable if any animal of others becomes infected by exposure to his herd. Where the veterinarians find the disease it is better to kill the animal.

The fact of pleuro-pneumonia in an animal does not decide that it is unfit for food use. This is determined chiefly by the severity of the sickness.

All farms or herds in the State which have been adjudged to have had infectious pleuro-pneumonia should, as a preventive, keep the cattle this spring and summer in temporary sheds, so that the others can be thoroughly cleansed of all moveable material and be well whitewashed. It is best to add four ounces of dry chloride of lime to a gallon of the whitewash. In any case the cattle will be benefited by this removal from the yards, and the farmer's interest be promoted by the removal of all suspicion of the disease. It is a short-sighted policy for any one for a little present saving to subject his cattle to continued suspicion, or to an actual and prolonged existence of the malady.

As it is believed that the chief contagion comes from the lungs it is best to sponge the mouth and nostrils of all well and exposed animals, twice each day, with a solution of chloride of zinc. The fifty per cent. solution (Squibb's) costs twenty-five cents per pound, and, diluted one-fourth, a tablespoonful of it

suffices each time. Or it can be purchased solid in ounce bottles for eight cents, and dissolved in a half gallon of hot water. A little tar rubbed in the mouth and nostrils also cleanses. Those about sick animals should wash their hands in the zinc solution. For various other disinfectants, see Third Report (or the last July circular) of the State Board of Health.

Every farmer who purchases new stock should, for a month, keep it apart from his herd while any infection is prevalent. No cattle should be allowed to pasture on commons, as this disease thus spreads in summer. Read the law and the penalties you may incur by spreading the contagion. It is to be remembered, that animals, in order to preserve health, need to be kept naturally; that they need right food, pure air, good water and exercise in order to be healthy. If well fed, and yet having neither rubbing nor exercise, the result must be to breed disease. It is profitable to change stabled cattle from their stalls from time to time. Some diseases are made malignant or contagious by closeness and filth. It is for the interest of all owners to adopt those precautions which, by the most successful dealers, are regarded advantageous. Milk is a great absorbent of contagion. It is very important that it should not be kept standing in or near the yards, but the cans to receive it should be outside the pens and yards, and removed as soon as the milking is over.

As the present law extends to the care of all infectious diseases of animals, and has not single reference to any one disease or any single year, we shall hope to aid and to be aided by all those who rightly estimate the great pecuniary profit and personal comfort of prevalent good health among the lower animals. Cows kept after the packed-herring system, or tied all winter in a stall, will not maintain good health, and will stand ready for any epizootic disease.

PNEUMO-ENTERITIS.—(HOG CHOLERA.)

There is evidence that this disease prevails considerably in some parts of the State. The loss to this country last year was about twenty millions of dollars from this disease.

It is actively contagious. The name cholera deceives as to it, for it is a fever in which not only the intestines, but the lungs and glandular system are usually affected.

It commences with loss of appetite and constipation; the skin becomes reddened and often pimpled. Cough and hurried respiration, as well as diarrhœa, are among the symptoms. About seventy per cent. of the pigs die in two weeks, while those surviving are of little value. The time of catching is generally from five to fifteen days. The only method of dealing with it is the same as with pleuro-pneumonia, viz: the killing of all sure cases, isolation of the sick, and an entire removal to another pen of all well ones.

The Board will be glad to receive information as to any prevalent disease of animals, and will give to the subject such attention as it may demand.

Whenever any contagious or infectious disease has caused the death of any animal, or is believed to exist in any neighborhood, any person may properly state the fact to us.

Copies of the law can be had on application.

Letters or postals should be addressed,

State Board of Health, Trenton, N. J.

TO TOWNSHIP AND CITY BOARDS OF HEALTH IN REFERENCE TO INFECTIOUS DISEASES OF ANIMALS.

CIRCULAR B.

TRENTON, April 10th, 1880.

Both public health and financial interest require local attention to contagious diseases among animals.

Infectious pleuro-pneumonia and other diseases of cattle greatly concern milk and food supply.

Pneumo-enteritis, or hog cholera, and other diseases of swine affect human health.

Glanders, a disease of horses, is directly communicable and very fatal to individuals.

Just now there is need to guard our State against infectious pleuro-pneumonia and to rid us of suspicion of its prevalence, which is far beyond the actual facts. It is a disease which, where it exists, should not be concealed and should be isolated, and no

communication with suspected herds should be allowed until all risk is at an end.

It is to the interest of every city and township now to see to it that the disease is prevented in their respective districts. City stables are oftener centres of contagion than are the herds of farmers.

The formation, under a recent law, of boards of health in each township and city of the State, and the new powers of the County Board of Health in Hudson county, enable us to have local oversight of these and other diseases throughout the entire State.

Both city and township boards of health are enjoined carefully to guard against all contagious diseases.

Let all local boards of health inquire also into such diseases of animals as seem to be contagious and notify the Board of the same. We have full power to examine and determine whether any contagious or infectious diseases exist among animals in this State. It is a work incidental to your oversight of the general health.

The late act as to diseases of animals does not restrict this power of local boards or that of township committees under former laws.

The township board of health should enjoin the assessor in his visit to find out the existence of any such disease. In cities local inspectors may do the same. No city is alive to its own interests as to milk and food supply and as to health conditions that does not learn where and how animals are kept within its limits.

When any local animal disease is reported to us, and authenticated as possibly infectious, we shall at once make inquiry, and, if really necessary, at the expense of the State, send an inspector. If the disease is found we shall certify the same to the owner or person having interest therein. We shall not quarantine but by his consent, but if not, shall give notice to him and others that the disease exists in his herd, and warn him that the law requires that he should notify the Board, and also of the penalties of purchase or sale as contained in sections five and eight of the act of March 12, 1880. If by delay in separating or killing infected animals, or by exposing others to the

contagion, other animals are affected, the owners thereof, as well as this Board, will have action in law against him.

In case of the slaughter of animals under our direction, they will be paid for at two-thirds their full actual value.

There is now so little of the disease in the State that it is all the more practicable to secure its complete eradication.

We have had the 110 herds which were in quarantine at date of March 10th, under the former authority, examined, and find not over two that are now centres of contagion and one other that has shown the disease since March 10th. We shall secure the complete isolation of these animals and the herds to which they belong. We shall seek the modification of New York restriction as not now needed toward our whole State.

While by consultation with the authorities of Pennsylvania, and with farmers and stock-raisers in our own State, we are satisfied that methods of ferry inspection are not feasible or successful, we have arranged a system of notification and oversight which will be no less efficient than the former plan in preventing the ingress of the disease from other States. A milk inspector, employed by the State, will aid in inquiry as to the contagious diseases of animals. While local boards must feel charged with the duty of looking after their own districts, we shall thus be able in various ways to aid local efforts, as well as to seek information through individual sources and by our own special methods.

All communications should be addressed

State Board of Health, Trenton, N. J.

CONTAGIOUS DISEASES OF ANIMALS.

CIRCULAR C.

TRENTON, August, 1880.

The State Board of Health has had oversight of the contagious diseases of animals since March 12th, 1880. Although cases of glanders and of pneumo-enteritis (hog cholera) have occurred, our chief attention has been called to the contagious diseases of neat cattle. Most of the herds in quarantine previous to March 12th, were so far recovered as not to need longer detention. We

have not been able to trace subsequent cases that have occurred in the State to these herds. Outbreaks which have occurred in some of the counties are now, we believe, under control.

In a township in Union county, where pleuro-pneumonia has long been troublesome, the township Board of Health has efficiently aided us. The most recent and troublesome cases are in Burlington county, where it has recently appeared in five herds, in which several cattle have been slaughtered. It is also under supervision in two other counties. We believe it is to be decided within the next year whether the pest shall be localized in our State. If any one doubts its devastating nature, its communicability or the calamity of its presence, we only ask that they will send to us for the names of farmers in our State who have recently suffered from it, and confer with them. The slaughter of all fresh cases and the separation of the exposed herds from all others is imperative. In every case we have had thus far, the disease is, we think, traceable to purchased cattle. Cows sold from infected herds or store calves, which have been taken from infected cows, often convey the disease.

No farmer or stock raiser should now make additions to his herd, unless he can trace the animal purchased and receive a warranty that there has been no exposure. Where cattle are bought it is well to keep them at least six weeks from mingling with the general herd.

Where the disease has manifested itself, we recommend the erection of temporary sheds until November and a thorough disinfection of all stables and sheds. Chloride of zinc is advised to be used for the sponging of the nostrils *both of the sick and well cattle*, where the disease has appeared.

An ounce bottle of the solid chloride, costing ten cents, can be dissolved in a half gallon of hot water, and from a half gill to a gill in all be given in the drinking water at different times each day. Common tar smeared in the nostrils is of service.

It is best to heap all manure outside of the buildings and to sprinkle hay or straw, which has been used, with some disinfecting solution, and remove it and whitewash the buildings.

Sulphate of iron (green vitriol or copperas) costs two cents per pound, and a pound to a gallon of water answers well for sprinkling over surfaces that have been exposed.

"Calx powder," made by powdering one bushel of dry char-

coal and two of stone lime and mixing them, is also a good corrective.

Sirel's compound consists of—

Sulphate of iron (green vitriol or copperas), 40 lbs.

Sulphate of lime (gypsum or plaster of Paris), 50 lbs.

Sulphate of zinc (white vitriol), 7 lbs.

Bone charcoal (ivory black), 2 lbs. (Or 6 lbs. of dry wood charcoal.)

This may be sprinkled dry over places exposed to moisture.

What is known as the "lime and salt mixture" is not only valuable agriculturally, as an addition to compost, but has valuable disinfecting and deodorent properties. It is prepared by adding one bushel of salt to three bushels of fresh slaked lime. Stir it frequently until the mixture becomes moist, and then add to it twice the amount of loose dry earth. This may be scattered freely over the ground where the cattle have been kept or have pastured.

During heavy winds or storms, all doors and windows of sheds should be fully opened, so that stalls and all parts may be flushed with air. There is much need of attention to the airing of stalls when the cattle are out of them.

There is reason to believe that many farms where pleuro-pneumonia has once occurred have had new outbreaks months after, in removing straw or hay, or by, in some way, stirring up infective particles which had been concealed. There is great encouragement to seek its prevention, since the disease is believed never to occur in this country, except as it is caught from some previous case or from exposure to the immediate grounds or buildings where the disease has before existed.

Farmers and dealers need to be watchful, and whenever any of their cattle seem ailing they should at once be separated from the rest. If they have good reasons to suspect it to be pleuro-pneumonia, or if the local veterinarian so pronounces it, there must be no delay in notification as required by the law.

Local boards of health and township committees may often be consulted with advantage. Where the disease prevails they are especially charged with the duty of preventing its spread.

They are the appointed guardians of the welfare of their respective towns and townships, and for mutual protection should aid in preventing the spread of so serious a disease.

Cattle must not run at large in townships in which it prevails. The milk from ailing cows should not be sold, although there is no record of the disease from this source. Yet common judgment teaches us that animals that are feverish and sick cannot furnish good milk. Cattle that recover from pleuro-pneumonia are generally left with one lung diseased, and they should be fatted. The disease thus far overcome does not effect the meat. As some believe that an animal once having had the disease may retain an infecting power or have an outbreak from the diseased lung, it is better to fatten any animal that has been known to have had pleuro-pneumonia and to have partially recovered.

If only for a year or two all will be diligent in preventing the outbreak and conveyance of this great pest, we shall get rid of it in this State.

Any inquiry may be directed

State Board of Health, Trenton, N. J.

AN ACT TO REGULATE THE SALE OF MILK.

A supplement to "An act to regulate the sale of milk," approved April fifth, one thousand eight hundred and seventy-eight.

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That the third section of the act to which this is a supplement, which section reads as follows:

"3. And be it enacted, That all penalties imposed under the provisions of this act, may be sued for in any county of this state where the offence is committed, in any court having competent jurisdiction, one half of the fine to go to the person making the complaint, and the other half to be paid to the county collector for the benefit of the county," be amended to read as follows:

3. And be it enacted, That all penalties imposed by the provisions of this act, may be sued for in any county of this state where the offence is committed, in any court having competent jurisdiction; that the state board of health are hereby empowered and directed to appoint each year a competent person who shall act as inspector of milk, at a salary not exceeding six hundred dollars per annum, payable on the order of the president and

secretary of the state board of health, approved by the governor, in quarterly payments for the purposes of this act, and who shall act until removed by said board or until his successor is appointed; said inspector, having reason to believe the provisions of this act are being violated, shall have power to open any can, vessel or package containing milk and not stamped or marked as directed by the first section of the act to which this is a supplement, whether sealed or otherwise, or whether in transit or otherwise; and if upon inspection he shall find such can, vessel or package to contain any milk which has been adulterated or from which the cream or any part thereof has been removed, said inspector is empowered to pour the contents of such can, vessel or package upon the ground, and bring suit against the person or party so violating the law, and the penalty when so collected by such suit shall be paid into the treasury of this state; that when suit is brought under this act by any person other than such inspector, the penalty, when collected, shall one half go to the complainant and the other half to the county collector for the benefit of the county.

2. And be it enacted, That this act shall take effect immediately.

Approved March 12, 1880.

NOTE.—A more stringent act has just passed.

AS TO MILK SUPPLY.

CIRCULAR A.

TRENTON, April 26, 1880.

The evils arising from the adulteration of milk are so serious that many of the larger cities, and many of the states, have found it necessary to enact laws or ordinances in reference thereto.

Not only is there an unfair and injurious competition when adulterated or inferior milk is sold, but great injury is done to the public health. Children are often compelled to rely upon purchased milk, and there is abundant evidence that much sickness and many deaths result from the impurity or bad quality of this food.

The unfairness of such traffic and the evil to consumers is such that the Legislature of this State, at its last session, directed the

State Board of Health to appoint a Milk Inspector. Applicants were subjected to a careful chemical examination as to their knowledge and general fitness for such an appointment. William K. Newton, M. D., was selected to fill the position. He will, with the aid and direction of this Board, seek to correct unfair dealing and to detect attempted frauds.

Milk may be defined as pure when it comes from a healthy cow, and when nothing is taken from or added to it.

The adulterations most common are as follows:

The dilution of milk by water.

The sale of skimmed milk as natural milk.

The separation of the strippings from the rest of the milk.

The removal of small quantities of cream, technically known as "topping."

The sale of milk from cows too soon after calving.

The sale of milk purposely impoverished by modes of feeding or keeping.

The addition of soda or other alkalies.

The use of materials to thicken or whiten the milk.

The addition of coloring or other matters to cover up some fraud.

The following is a synopsis of New Jersey State laws, bearing on the subject of our milk supply:

Act of April 7th, 1875. The sale or keeping of adulterated milk is a misdemeanor, punishable by a fine of $50, and imprisonment for thirty days. To adulterate milk, or to keep cows for the production of marketable milk in an unhealthy condition, or to sell milk as pure milk from which the cream has been taken is also punishable as above. The addition of *water or any substance* is defined as an adulteration. Milk from cows fed on distillery waste (commonly called "swill") is declared impure, and contrary to this act.

Act of March 23d, 1865. To sell or bring to a cheese or butter factory adulterated or "skimmed" milk, or to keep back any "strippings," is punishable by a fine of $15.

Act of April 5th, 1878. Every person who shall sell, or who shall offer or expose for sale, any milk from which the cream, or any part thereof, has been removed, shall distinctly and durably stamp or mark, in letters not less than two inches in length, in a conspicuous place, above the centre, upon the outside of every

can, vessel, or package containing such milk, the words "skimmed milk," and such milk shall only be sold or shipped in or retailed out of a can or other vessel so marked.

Violations of this act are punishable by a fine of $50. The sale or exposure for sale of milk contrary to this act is presumptive evidence. The non-payment of the fine is punishable by imprisonment.

Act of March 12th, 1880,—supplementary to the above act. The State Milk Inspector is appointed and empowered to open any can, vessel or package containing milk, whether sealed or otherwise, or whether in transit or otherwise; and if upon inspection he shall find such can to contain milk which has been adulterated, or from which the cream, or any part thereof, has been removed, the inspector is empowered to pour the contents of the can upon the ground, and bring suit against the person violating the law. (See new law of 1881.)

Any citizen may act as complainant under these acts.

We ask the assistance and co-operation of all local boards of health, local inspectors, city and county physicians, and people interested in the supply of pure milk.

The State Inspector will visit in turn the various parts of the State, unknown to dealers, in order to check the sale of adulterated and impure milk. He will be provided with all the approved instruments for testing milk, and will, when necessary, make analyses to determine adulteration, etc.

It will be his aim to prevent dishonest dealing, so far as it affects the common interest of the milk trade and the health of our citizens. He is also to investigate evils to the milk supply that may arise from improper feeding, improper housing, or from existing diseases among milch cows.

Action at law will be had when required, or his services be available in evidence.

Communications may be addressed to William K. Newton, M. D., Paterson, or to the State Board of Health, Trenton, N. J., which intends to fully sustain the efforts of the Inspector in preventing a fraud so detrimental to the public health.

CIRCULAR TO LOCAL BOARDS OF HEALTH

And to those whose duty it is to make returns of Marriages, Births and Deaths.

The Index for the statistical year just ended, indicates an increase in the returns of marriages and births for the State, and a decrease of over one thousand in the returns of deaths. We have reason to believe that all returns have been more faithfully made than in any previous year, and the diminution in death certificates has been owing to a decrease of the rate of mortality.

By a comparison of our returns from different city clerks and assessors, we are more and more seeing how much of the perfection of the record depends upon careful attention and supervision of these officers. Carelessness or want of judgment on their part soon begets carelessness or neglect in those who by law are required to make the returns to them. Local boards of health are now so organized under the law that their influence can be brought to aid, where there is negligence, or they or the assessors can send direct notice to any who overlook their duty. It is enough here to say that accurate vital returns, by all States and countries are recognized as the "account of stock," without which a State or district cannot know its health condition, or provide therefor, any better than a merchant can reckon, without knowing the material on hand and the influences that are reducing its value or destroying it. Already in comparison of returns we are able to trace and compare localities of disease, which means abatement thereof, under the use of proper methods. Many of our cities are needing to study streets and blocks as related to disease. Townships may learn much by finding out through series of years what parts are most affected. Where ministers are dilatory as to marriage certificates, where physicians neglect to make returns of births, or where undertakers neglect to secure the burial certificates until after burial, and continue to neglect after being cautioned, it is the duty of the assessor and of the Local Board of Health to report the fact to the Bureau of Vital Statistics, which is under the Department of the Secretary of State. If any person hereafter fails to find the record of his or her marriage, or if the birth of a child, or if the death of a relative is not filed in this office, it may involve losses and embarrassment

for which the party neglecting is culpable under the law. Recently most important recourse has been had to these records, in testing the claims of life insurance, in legal proof of property rights, and in comparisons for the coming National Census; at the same time there is increasing evidence that physicians are appreciating these returns, as a part of their professional relation to their patients, and a duty the same as that which has so long been acquiesced in by those who have official charge at marriages, and by undertakers. The licensed medical profession is receiving recognition which is more than a pecuniary pittance, and more of the people are appreciating the great interests of public health thus promoted. We, therefore, ask as the part of all officers a vigilant and systematic attention to the reception and transmittal of the returns.

Blanks may always be had of the city clerks and assessors, or by application through postals directed to this office. A paper-bound book of blanks will be sent to such as require fifty returns of either kind each year. Physicians who may fail to receive the Annual Report will please notify us, and any clergyman may have it on application.

By order of the Bureau of Vital Statistics.

CIRCULAR AS TO SMALL-POX.

TRENTON, February, 1881.

The State Board of Health has evidence of the existence of *small-pox* in scattered localities in this State, as well in the cities of New York and Philadelphia. The epidemic, as existing in Camden long since, upon the invitation of the local authorities, received our attention, and vigorous measures were instituted by them. But now, from other sources, scattered cases have occurred in other towns and in rural districts, until it may easily become a wide-spread epidemic. Four or five cases, occurring in Trenton, have already disbanded the Normal School.

The right of school trustees to require vaccination in order to secure attendance at school in times of epidemic, or else to prohibit attendance is not questioned. By the terms of the health laws of March 11th, 1880, all school boards are authorized to vacci-

nate, at public expense, any pupils attending school who are unable to procure vaccination.

All local health boards need to see to it that vaccination is recommended, as well as rapid isolation of cases secured, if any occur. The cost of local epidemics of small-pox is very great, besides the risks to life and public health. The prevention of the disease is within the range and duty of your control. All our local health boards and school boards should co-operate in influence and provision for more general vaccination, and for re-vaccination of persons who have not been vaccinated since full growth. The heads of large manufacturing establishments need to attend to it, both in the interest of capital and labor. Trenton has set a good example in making the means therefore accessible.

Most of our physicians have full confidence in humanized vaccine virus, which is easily secured. *Vaccine virus directly from the animal* is preferred by those who have any fear of communication of other diseases through humanized lympth—a fear that is greatly magnified in the popular mind. It is, nevertheless, due that all have their preference, and that where vaccination is insisted upon as a condition of school attendance, bovine virus be used if desired. Many physicians prefer to use this. The New York City Board of Health, 301 Mott street, New York, furnishes it daily by mail. H. A. Martin & Son send it direct from their herd, Roxbury Station, Boston, Mass. Dr. E. L. Griffin, Fond du Lac, Wis., is prompt in remittal from his vaccine farm. Ready supplies can also be had from Philadelphia and other cities. The price per point is about twenty cents, and less in larger quantities. It can often be had from local druggists. There is reason to believe that much is sold for bovine virus which is not such, and that there is a failure in effect because of age and imperfect keeping.

We urge upon all physicians great exactness in selecting virus, and upon the people protection from the disease. Its outbreak every few years is not a proof of epidemic tendency. The periodicity rather occurs because that, after an epidemic, as soon as years enough have passed for a younger product of children to be out in public child-life, this susceptible material becomes so abundant as to insure extension if a single case is introduced from another section. Then there is an outbreak of

small-pox and of vaccination. Would it not be better if, somehow, the young population could be systematically protected? Let our various communities and the local boards now secure this, not only under present threatenings, but also as a wise preventive measure.

Copies of this circular will be sent more fully on application by postal to State Board of Health, Trenton, and any inquiries be promply answered.

IMPORTANT LAWS BEARING ON PUBLIC HEALTH,

PASSED BY THE LEGISLATURE WHICH ADJOURNED MARCH 25, 1881.

I. An act relating to Local Boards of Health.

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That all township or local boards of health in this state, organized under the provisions of an act passed March eleventh, one thousand eight hundred and eighty, entitled "An act concerning the protection of the public health, and the record of vital facts and statistics relating thereto," may expend, for the purposes for which said boards are authorized, to the amount of fifty dollars as actual expenditure, not including any payment to members for attendance at the meetings of said boards, and the same shall be payable in the same manner as other bills presented to the collector, treasurer or other disbursing officer of the township, town or precinct; and in case any additional sum is, in the judgment of such board, needed to be expended in any township, town or precinct, the need thereof shall be presented to the township committee, common council or other governing board, and they shall have authority to appropriate such an amount, or pay such bills, as they may deem necessary for the purposes indicated in the act aforesaid.

2. And be it enacted, That any boards of health now organized in any of the cities of this state, under the provisions of their respective charters, as well as those which are only health committees, may, by the order and direction of the mayor and common council of said cities, organize their boards in accord with the provisions of the act aforesaid, and shall, in common with the boards of health of the several townships, towns or boroughs

of this state, have power to make and enforce such ordinances as the care of the public health demands.

Approved March 22, 1881.

II. An act entitled "An act to provide for drainage where the same is necessary to the public health."

This act gives well defined powers, and with judicious application can do very much to rid the State of malarial localities.

III. An act to prevent the adulteration of milk and to regulate the sale of milk.

Its terms are definite. The Milk Inspector must be a public analyst, to make "analyses, investigations of foods, drugs and other substances, as he may be directed so to do by the State Board of Health."

IV. Supplement to an act to regulate the practice of medicine and surgery. Approved March 22, 1881.

It adds the words "professional service," and increases the power of the law.

V. An act to authorize cities to construct sewers and drains and to provide for the payment of the cost thereof. Approved March 22, 1881.

VI. A supplement to " An act for incorporation of companies for draining and improving meadows and lands overflowed by tide-water.

VII. An act to prevent the adulteration of food or drugs.

VIII. A further supplement to an act entitled " An act to establish a State Board of Health," etc.

This act relates to the " Contagious Diseases of Animals," and gives to the State Board full power and control as to them, recognizing also the co-operation of local boards.

Other acts do not reach us in time for report.

SPECIMEN SCHEDULE OF SANITARY INQUIRY, (INSTITUTIONAL) BY THE NEW JERSEY STATE BOARD OF HEALTH.

Name and post-office address of institution.

Name and post-office address of physician.

Name and post-office address of chief officer.

Location.

Are buildings owned by township or county?

Area of ground and altitude above sea level.

Character of soil.

How are grounds improved?

General character of buildings and material of construction.

Date of erection and cost.

Average yearly cost of repairs.

Is there an accurate geological map and description?

Are there contour maps, topographical maps, and a plan and schedule of all underground apparatus or appliance?

Have natural water-courses been disturbed?

Is there any damming up of water for ponds?

Give place, size, depth, character and locality of any springs and wells.

Are they opened or closed, and what is the mode of getting water therefrom?

Is there any artificial drainage?

Size of rooms for bed or sitting rooms on first floor.

Size of rooms for bed or ward rooms on second floor.

Size of rooms for bed or ward rooms on third floor.

What is the finish of walls?

Are the rooms wainscotted?

How near to ceilings are windows?

Are there windows, shutters or blinds?

How is admission of sunlight regulated?

Is there shade?

Does sunlight enter all the rooms?

Have you had any accident?

Are all children vaccinated?

Have all adults been vaccinated within ten years?

What facilities have you, besides ordinary house cleaning, for cleansing and varnishing of furniture and bedsteads, mattresses, &c.?

Do you have wood or iron bedsteads?

Is there any system by which new suits of outside clothing are furnished to inmates and by which clothing long worn is cleansed by airing or heating?

What are the facilities for bathing and washing for inmates?

How is laundry work conducted?

Are the inmates fed in their rooms, or when able, do they come to a common table?

What is the arrangement for drainage?

What is the size, shape, thickness, construction and preparation of pipes? How joined?

Is there a basement or cellar? Is there an unoccupied attic?

How are these ventilated?

How much below ground level, and how occupied?

Does water ever stand in it?

Are walls and floors concrete?

Are sewers connected with drains?

How?

Give the exact fall per foot, and any variations.

How are sewers ventilated?

Are there grease traps?

What is the indoor water-closet arrangement?

Are water-closets in projections, or separated by corridors?

If there are any sewers or pipes leading from the house, give their size and construction and fall and outlet.

Give modes of ventilation, kinds of traps and just where located.

What is the out-door arrangement?

How often is the material removed, and by what method?

Do fecal and slop material mingle?

If separate, are urine and waste water separate?

How is slop-water disposed of?

What is the system of flushing or disinfection?

If to a cesspool, describe it and where it empties, and how it is cleansed and how often?

Is there open ventilation between the cesspool or sewer and the house?

If so give full plan.

What is the water supply?

Is it brought on all the floors, and how?

How is the water stored?

Is there an overflow pipe? If so how trapped and joined to what outlet?

If in cisterns, how often cleaned?

What their locality?

Is provision made for the "washings" of the roof to be carried off first?

Of what material is the roof?

If no cisterns, how is the roof water disposed of?

If water is got from wells, what are the chances for contamination with sewage or surface drainage?

Is there any reason to suspect impure water?

What is the system of ventilation?

Give full plan.

Have there been anemometer or other tests?

Is there any provision for changing the air of rooms during cold weather?

Have the heating and ventilating appliances been tested in varying conditions of atmosphere?

What is the method of heating?

Give plan.

How many wards or bedrooms have fire places?

What was the average number in the house last year?

What was the expense for maintenance last year?

What is the plan of outdoor relief?

What was the cost last year.

Have you a regular dietary each day?

If so, give the dietary each day.

Have you any insane paupers?

How many are demented or foolish?

How many are harmless?

Are they, or should they, be separately kept?

What are the arrangements for separation of males and females?

What are the nursing arrangements?

What is the medical attendance?

How is it arranged for?

How much is paid therefor?

How are medicines furnished?

Are any disinfectants kept on hand?

If so, how used?

Inform us what changes are needed in all present arrangements.

Physicians will state any facts of interest regarding sickness during past year, or sanitary defects existing.

What was the number of deaths, and their causes, last year?

Have you any system of employment for inmates?

What is the discipline and oversight of attendants?

Is any special industry followed?

If so, give particulars.

Is it profitable, or merely for occupation?

How many inmates have tobacco furnished them?

How many have opium furnished them?

What was the tobacco bill last year?

What was the liquor bill?

What was the quinine bill?

What are the arrangements for schooling children?

Are any apprenticed out, and at what age?

Are places sought for any not yet apprenticed?

What visitation have you that looks into the moral and physical welfare of the inmates? What provision therefor?

What provisions are there for amusements or for reading matter for inmates?

How many of the inmates were born in dependency?

What provision in case of fire?

What is the method of lighting?

Is any register kept of inmates as to habits, cause of dependence, mental condition, &c.?

What is the cubic space per inmate?

What are the hospital arrangements?

Is there any oversight of or inquiry into the physical condition of inmates?

SPECIALLY FOR JAILS.

Have any been detained as witnesses in cells during the past year, and how long?

What system have you for receiving excretions of the body during the night?

What in cases of sickness?

What are the chances for sunlight to enter cells and corridors?

Are prisoners allowed to smoke and make ablutions in the cells?

Cubic space of each cell.

What chance for change of air in cells?

If prisoners are suddenly taken ill in the night, how may they summon assistance?

Size of windows in cells.

Size of doors.

Amount of sickness and number of deaths yearly.

REPORT

OF THE

BUREAU OF VITAL STATISTICS.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

BY EZRA M. HUNT, M. D.,

Medical Superentendent of State Vital Statistics.

THE CENSUS,

AS BEARING UPON QUESTIONS OF POPULATION.

The great design of vital statistics is to furnish an estimate of some of the most important conditions of population, and to aid in those objects for which an enumeration of inhabitants is instituted. Statistical inquiry has now come to be such a science and such a practical art of political economy, that the mere record of numbers is only one of the incidental purposes of statistics. Yet this must be accurately had in order to estimate the relative conditions and the ebb and flow of population.

The census of 1880 has been taken with more regard to extended studies of social, and race, and economical conditions than any that has preceded it. The large number of schedules furnished shows the range of inquiry. It still remains to be shown how the facts and figures obtained are to be most successfully applied to the study of the various branches of social study. Still more importance attaches to the census from the fact that the general government has also made provision to aid in the semi-decennial census, and thus prepared the way for a closer study of the people.

An effort was made to obtain returns in this regard from each State. While the plan showed the broad and just conceptions of the superintendent and his advisers, it also demonstrated that for vital returns its chief reliance must be upon statistics obtained near the time of the occurrence of the events. So the State bureaus will need to secure the most of this kind of information.

In the study of population in the States, an early question to be decided is, what shall constitute the sanitary unit of inquiry. Shall the vital conditions and the health of the people be compared by counties, or by townships, or by cities, towns, villages and rural districts. Shall there be comparisons with reference

to the geological basis, since, as in our State for instance, definite lines in this respect can be drawn? Or shall areas be taken with reference to special water-sheds, with comparisons of highland and lowland, mountains and of valleys with extended river relations. Or shall the comparison be made between dwellings upon the sea-shore districts, and those amid hill and mountain ranges. Or shall climate come into consideration, in a State so diversified as ours? These, and such like questions, naturally suggest themselves. Each in their turn, and when enough facts are gathered, will be worthy of thought and comparison.

But with present facts and present methods of obtaining a census, our first natural enumeration for comparison is by townships. In each township the area is sufficiently narrow to present the people as subjected to much of the same general kind of local influences. A variation, however, needs to be made in reference to the larger cities and towns. The smaller villages differ but little from the rural parts of the townships.

But so soon as population is aggregated in cities, it has its own consequent complications or changed conditions. So the larger cities need also to be compared among themselves. City Boards will need to compare parts of the same city with each other by wards or districts. Our State law provides that the vital facts as to cities of over 5,000 inhabitants shall be tabulated separately in order to facilitate comparisons. We, for the present, shall here give only two comparative tables, viz: one presenting the Census of 1880 n order to show actual present population and relative growth, and second, the same as to all cities now of over 5,000 inhabitants.

We also add as an item for information without distinct classification, the size of other towns and boroughs of this State so far as they can be separated from the township precincts with which they are enumerated, so as to aid in local comparisons, although there is great variety of incorporation, so much so that a commission not long since reported it impossible to enumerate the towns of the State. Yet the approximate statement is valuable for reference and to aid in future adjustments as to local boards of health. In a few cases comparisons of smaller localities cannot be accurately made without remembering that new townships have been formed on the area changed; where this is the case the fact must be borne in mind.

We give the census record in order to facilitate comparisons and for future study of the vital conditions and variations of the population. There may be some small corrections to be made in the last census, but these can be noted hereafter.

Entire population of the State	1870	907,144.
" " "	1875	1,019,413
" " "	1880	1,130,892

The present total of 1,130,892 presents for the State a population 75,698 less than the total of New York City.

It is made up as follows:

Males	559,803
Females	571,089
Native	909,309
Foreign	221,583
White	1,091,856
Colored	38,796
Chinese	176
Japanese	2
Indians	58
East Indians	2
Albinos	2

These figures, as those following, are still subject to possible corrections from the census office.

LIST OF CITIES, TOWNS, VILLAGES, ETC., OF THE STATE, SO FAR AS THESE CAN BE GIVEN, WITH THEIR POPULATIONS.

NOTE.—Some towns have not been enumerated or reported in the census distinctly from the townships in which they are included. We give the list of every precinct, which differs in any wise from a township method of oversight, and the forms of its government so far as possible. There is great need in this State of some general law as to these organizations, and such uniformity as will admit of comparative study. As far as possible the mode of government will be indicated and the population, as distinct from the township, given so as to aid in future vital statistics. Where the town population is not given distinct from the township, the population will be marked *Twp.* The populations will be given as far as possible as by the census of 1880.

Atlantic County.

Absecon, town, in Egg Harbor township	507	
Atlantic City, city	5,477	
Egg Harbor City, city, in Galloway township	1,232	
Hammonton, town	1,776	Twp.

Bergen County.

Hackensack, in New Barbadoes, township	4,250	Twp.

Burlington County.

Beverly, city, in Beverly township	1,759	
Bordentown, city, in Bordentown township	5,334	Twp.
Burlington, city, in Burlington township	7,237	Twp.
Pemberton, borough, in Pemberton township	799	
Mount Holly	4,630	Twp.
Fieldsborough		

Camden County.

Camden, city	41,658	
Gloucester, city	5,347	
Haddonfield, borough, in Haddon township	1,480	
Merchantville, borough, in Stockton township	3,093	

Cape May County.

Cape May, city	1,699	
Cape May Point, borough, in Lower township	198	

Cumberland County.

Bridgeton, city	8,729	
Millville, city	7,660	
Vineland, in Landis township	6,005	Twp.

Essex County.

Belleville	3,004	Twp.
Bloomfield	5,748	Twp.
East Orange, city	8,349	Twp.
Irvington, village, Clinton township	2,742	Twp.
Montclair	5,146	Twp.
Newark, city	136,400	
Orange, city	13,206	

South Orange, village	3,911 Twp.
Clinton, town	2,742

GLOUCESTER COUNTY.

Woodbury, city, in Deptford township	2,298

HUDSON COUNTY.

Bayonne, city	9,372
Guttenburgh, town	1,206
Harrison, city	5,510
Hoboken, city	30,999
Jersey City, city	120,728
Union, town	5,849

HUNTERDON COUNTY.

Clinton, borough	842
Frenchtown, borough	1,039
Lambertville, city	4,183

MERCER COUNTY.

Chambersburg, borough	5,437
Hightstown, borough, West Windsor township	1,396 Twp.
Princeton, borough	4,348 Twp.
Trenton, city	29,910

MIDDLESEX COUNTY.

New Brunswick, city	17,167
Perth Amboy, city	4,808

MONMOUTH COUNTY.

Asbury Park, borough, Neptune township	4,187 Twp.
Freehold, town	4,302
Ocean Grove, Neptune township	4,187
Red Bank, Shrewsbury township	5,059 Twp.
Long Branch, Ocean township	6,027 Twp.
Keyport, Raritan township	3,891 Twp.
Matawan	2,699

MORRIS COUNTY.

Boonton	2,685 Twp.
Dover, Randolph township	7,701 Twp.
Morristown, town	6,838 Twp.

Ocean County.

Only Townships.

Passaic County.

Passaic, city	6,532
Paterson, city	50,887

Salem County.

Salem, city	5,057

Somerset County.

Somerville, town, Bridgewater township	7,997 Twp.

Sussex County.

Newton, town	2,513

Union County.

Elizabeth, city	28,229
Rahway, "	6,454
Plainfield, "	8,126

Warren County.

Belvidere, town	1,773
Hackettstown, town	2,502
Phillipsburg, city	7,180
Washington, borough	2,142

According to this we find that of the 1,130,892 of the inhabitants of New Jersey about 690,000 live in cities, or some form of incorporated towns. When our vital statistics reach over a greater number of years, there will be still more opportunity to study the effects of locality and of different density of population upon life and health—as also upon local prosperity.

From these we at present select out and associate cities and towns according to their population.

OVER ONE HUNDRED THOUSAND.

Newark, Essex county	136,400
Jersey City, Hudson county	120,728

Note.—Hoboken is so much a part of Jersey City that its close

proximity must be borne in mind in all vital study. The same is partly true of some of the suburbs of Newark.

BETWEEN SEVENTY-FIVE AND ONE HUNDRED THOUSAND.

No city.

BETWEEN FIFTY AND SEVENTY-FIVE THOUSAND.

Paterson, Passaic county	50,887

BETWEEN TWENTY-FIVE AND FIFTY THOUSAND.

Camden, Camden county	41,658
Hoboken, Hudson county	30,999
Trenton, Mercer county	29,910
Elizabeth, city, Union county	28,229

In reference to Trenton, it is also to be remembered that Chambersburg joins it closely with 5,437 inhabitants.

FROM FIFTEEN TO TWENTY-FIVE THOUSAND.

New Brunswick, Middlesex county	17,167

FROM TEN TO FIFTEEN THOUSAND.

Orange, Essex county	13,206

FROM FIVE TO TEN THOUSAND.

Bayonne	9,372
Bridgeton	8,729
Plainfield	8,126
(North Plainfield, 3,217 additional.)	
Dover	7,701 Twp.
Millville, Cumberland county	7,660
Phillipsburg	7,180
Burlington, township	7,237 Twp.
Montclair, township	5,146
Union, Hudson county	5,849
Harrison, Hudson county	5,510
Atlantic City, Atlantic county	5,477
Chambersburg, Mercer county	5,437
Gloucester City, Camden county	5,347
Bordentown, Burlington county	5,334 Twp.
Salem, Salem county	5,057
Morristown, Morris county	6,838 Twp.

Passaic City, Passaic county	6,532
Rahway	6,454

We have placed in this list those cities of over 5,000 in which, although the township population is included, it is so inconsiderable as not to affect the general estimate.

We now name others in which the city population, as distinct from that of the township, is unknown, but in which the township forms a considerable per cent.

Somerville, Somerset county	7,997
Bloomfield, Essex county	5,748
Red Bank, Monmouth county	5,059

CITIES, TOWNS, ETC., BETWEEN TWO AND FIVE THOUSAND.

Mt. Holly, Burlington county	4,630 Twp.
Princeton	4,348 Twp.
Lambertville	4,183
Asbury Park	4,187 Twp.
Boonton, Morris county	2,685 Twp.
Newton, Sussex county	2,513
Hackettstown, Warren county	2,502
Washington, Warren county	2,142

The death rates of these thus admit of comparison, although a period of about five years of observation is necessary, unless the indications of local disease are very apparent. These facts are thus put on record in order to aid the Central Bureau and all Local Boards in their study and tabulation of Vital Statistics.

The census of 1880 will be found for each township in the death rate tables, and need not be repeated here.

YEARLY OUTLINE AND SUMMARY.

In dealing with vital statistics, we need at the start to have clear views as to the intent of the record. One part is purely for legal use; another only for vital study. A third part has a mixed value. The relative proportion to be determined by the bearing of the information given.

Thus the name of a deceased person is secured for legal identification; the *cause of death* for its bearing on the vital concerns of community, while the place and time of marriage, birth or death have value in their relation to questions both of legal and vital import.

While the importance of such a registry has long been recognized, and a method of securing it has long been in exercise, its inadequacy, its incompleteness, and the absence of any system of indexing, has made it unsatisfactory both to those who have gathered the facts and to those who have had occasion to make search of the record. The laws of inheritance, the requirements of pension laws, of life insurance, and the official seal so often required to authenticate dates of marriage, birth or death, have made it now most essential. Hereafter the Marriage, Birth and Death Records of the State will be of far greater service in establishing rights of property. It will only be culpable negligence on the part of those who are to make returns that will omit the record of any marriage birth, or death occurring in the State. References which it formerly sometimes took hours to verify, can now be made in a few minutes.

It is easy to see that every State should be able to certify those events which have to do with the rights of the individual. The importance of these as a portion of the statistics which all governments are now securing, and their vital bearing on the laws of health, life and population, adds to the necessity and has fully justified the additional care with which such records are now sought and tabulated. Statistics mean the account of how things

stand. This bureau is a central audit of one of the great concerns and resources of the State. It attempts to estimate those vital facts which have so much to do with real prosperity, and to get such information as shall point out how and where our people are suffering from physical disabilities which can be mitigated or avoided.

No sooner had the work of receiving and studying the vital returns been started than it became apparent that the preliminary study must be to prepare a plan of index which should admit of ready reference, for all purposes, whether legal or medical, for which such records are kept. For the first year, under a change in the law, it unavoidably fell to the lot of the medical superintendent to initiate and give direction to this work, and to aid in and provide for the clerical labor needed. A thorough system was adopted, and such full transcription is now made as fully commends itself to the State Board of Health and to all those who have occasion to consult the records.

SECUREMENT OF RETURNS.

The first effort is to secure completeness and accuracy of returns. While we have no reason to complain of any indisposition to fulfill the conditions of the law, any system that looks to the careful collection of vital facts, requires constant vigilance to prevent neglects or oversights. City clerks and assessors, as a rule, have performed their duties with faithfulness and made their returns with commendable promptness. They are sometimes annoyed by delays or neglects on the part of those whose duty it is to send certificates to them. The legal right which the parties have to a record of marriage as well as the requirements of the law, are fully recognized by those who officiate. The former law not only did not pay for a certificate, but practically made it the duty of the person officiating to record the marriage at a county clerk's office, and pay one shilling therefor. This law is much simpler in its process and entails no expense. We only need to urge upon all parties that they see to it that this record is secured and sent promptly to the city clerk or assessor. A neglect may at any time subject to a penalty at law from the parties concerned as well as from the State authorities. A comparison of the returns for the last two years under the former

law as to marriages, and for the first two years under the new law, shows a satisfactory gain as follows:

Year 1877,	Marriages	6,022
" 1878,	"	5,375
Total		11,397
Year 1879,	Marriages	7,096
" 1880,	"	7,935
Total		15,031

Although some of the increase may be attributed to a better financial condition, the increase is mostly in record and due to the greater facility of the present law.

The returns of death, we believe, are very complete under the present methods. When the alteration was made for townships, by which the certificate of death, in case of death or burial outside of city limits, would serve as a permit, if returned within five days, it was feared that this might lead to carelessness on the part of undertakers in making their returns. A few cases have been reported to us in which the undertaker has not procured the certificate until after the burial. The law, with its present wording, gives no unnecessary trouble, and undertakers need to know that the intention to procure a certificate very soon is not enough. All sextons and keepers of cemeteries must see either the permit or certificate of death before the burial. For any neglect or delay the full responsibility rests with those in charge of the funeral.

Boards of Health should furnish us with the names of any undertakers who are careless in this regard, or should draw their attention to the remissness.

It is satisfactory to find in a study of the certificates of death, that care is taken in stating the causes of disease. It is unavoidable that in rare cases there is doubt, or that some practitioners betray a tendency to indefiniteness, which is a defect of education or experience, rather than of intent. But no one can handle 20,000 of these certificates without seeing that these sources of error are largely overcome by the general reliability and exactness of return. Where there has been reason to object

to vagueness of return in causes of death, they have been chiefly such as these.

Congestive chill and congestive fever are not good terms, unless under the secondary heading there is some reference to the supposed cause. General debility for a child, over one month of age, or for a person under the age of sixty, is also too vague. Fever alone is too indefinite.

Teething should have added thereto, the prominent symptom, as diarrhœa, convulsions, etc. Marasmus often needs a secondary noting. A return of septicaemia or pyaemia should state the organ involved, if there is a local abscess or other organic lesion.

NOMENCLATURE.

It is a question which must early have the attention of our medical men and of vital statisticians, whether some change is not desirable in the accepted nomenclature of disease. When the English classification was adopted, it was not without careful study and examination by committees which represented the best talent of the nation. While, therefore, no abrupt changes should be made, it is admitted that new diseases, or new types of old diseases, or new knowledge as to diagnosis, should introduce some changes. Our own country adopted this nomenclature because we had none of our own. There are diseases special to our own continent and others, greatly modified by locality, and such as need more careful noting.

An important conference of vital statisticians from many of the States was held in May last at Washington, under the auspices of the National Board of Health. Under its order correspondence is now being had on this subject. It is probable that some changes will be made, or that there will be some adaptation to our changed American conditions. As it is also very desirable to have that uniformity by which the States can be compared with each other, an effort is being made to unify the systems now used and thus make the whole available for the general government.

It is now evident that medical science is gaining aid from numerical methods of study; that sanitary science is largely guided by such data, and that both are giving prominence and success to medical art. It is now scarcely necessary to show to

the physician that benefits accrue to himself and to his profession as well as to society at large, from a close study and classification of disease.

In reference to the returns of births, it will ever be the case that there are some neglects. Those who are in the habit of carrying a few blank forms in the pocket, and who make the record at the time of attendance, find it little trouble, while those who leave cases to collect, and then have not the data at command, may easy make a burden of what would otherwise be too trivial to mention. Yet it is a pleasure to say that the evidences of co-operation and of increasing interest are manifested both in the increase of returns and in the active efforts of local practitioners. Where there is imperfection of returns we already have enough localities in which there is greater completeness to serve as a standard of comparison. For instance, Paterson shows a birth rate so much larger in proportion than Camden, and is so much more approximately correct, that with it and four or five other cities to guide, it is not difficult to arrive at what the birth rate of the latter should be. Especially as now a quinquennial census and local enrollments are likely to aid us in the correction. These cannot take the place of the record of an event at the time either as a legal or vital fact, but greatly aid in arriving at correctness of conclusion. Also the deaths under one year, added to the living in any one year, enable us still more closely to reckon the birth rate.

The importance of having the birth rate in order to know the significance of the death rate, is apparent from the fact that we must know the age of the material with which death is dealing. A mortality of 30 to 1,000 among adults is quite different in significance from what it is among children.

A very large infant mortality, especially in the summer, is one of the greatest indices of the prevalence of avoidable causes of disease. Mr. Edmunds, in his article in the *Lancet*, has also shown how mortality bears a certain relation to sickness at each age. In the English computation it is found that "for every annual death, two persons are suffering from sickness of a severity that disables laboring men from work." Mr. Neison for friendly societies, which exclude children, computed 2.5 constantly sick to one death under 60. Taking into consideration the number of sick that recover if every death stands for over 600 days of sick-

ness, it is easy to see how avoidable sickness is a heavy tax on all industrial and social interests.

STATISTICAL INQUIRIES OF THE GENERAL GOVERNMENT.

It is encouraging to all State and Local Boards of Health that the General Government is, in connection with the late Census, giving such attention to these vital returns. The regional and mortality maps of the last Census were published with an announcement of their incompleteness, but were of very great value as showing the outreach and feasibility of effort to study the zones and habitats of disease. Gen. Walker, under the direction of Congress, made elaborate arrangements to collect more accurate data for the tenth Census. He has so far recognized the value of the methods and returns of this State, that it is one of the two or three he has called upon to aid in furnishing standards of comparison by which to rate sectional defects. It only needs that the plans now adopted be followed out by us, with such additions as experience may suggest in order, in due time, to secure an amount of reliable statistical data that can be made available in many directions. It is probable that some changes will be agreed upon and therefore we can await these.

USES MADE OF STATISTICS.

The Registrar-General of England says, that such a system has enabled the government to acquire a general knowledge of the state of the population of the kingdom. Studying thus the causes that influence the health of the people, we are able to point out local defects and to guard against the evils which cause unnecessary sickness and untimely death.

Parkes, the leading sanitary author of England, shows that "the attention now paid to public health is in a large degree owing to the collection of the statistics of births and deaths, and the causes of death which have been collected in England for the last thirty-eight years. It may truly be said, indeed, that not only all Europe, but gradually the entire world has been influenced by the work."

Its direct practical bearing becomes at once apparent when, as Dr. Elisha Harris expresses it, we note of "the fact that the death rate of living people fluctuates from eleven to forty, fifty,

sixty and eighty per thousand each year in different places, the fluctuations being directly chargeable to the locality, the domestic, the personal and certain avoidable vital conditions of the population which present these variations in excess of a minimum rate of mortality."

It is also to be borne in mind that the discovery by Dr. Snow, of London, as to the relation of water-supply to cholera and those as to the dependency of typhoid fever on fecal contaminations were directly the result of the statistical method of inquiry. The consequence has been, as to the more general diseases, that, "in many cases, those districts which the statistical returns showed to be in the worst conditions have come to be the best," just because the exhibit of figures and facts aroused the local authorities to action.

In our own country, Massachusetts and Michigan, as well as some of our most populous cities, have much profited by these returns. Many of the zymotic diseases have had the line of their incidence traced, although so much remains to be discovered. "It is not too much to say that modern sanitary science owes its existence to the registration of deaths and the localization thereby of insanitary conditions"—Mass. Rep., 1877. Dr. Bowditch, in an analysis of 45,000 cases of consumption, has been able to show a very close connection between soil dampness and the prevalence of that malady. These are but illustrations of series of facts which are being tabulated and arranged by close observers as carefully as are the statistics which aid in the study. Political economy and industrial interests no longer need to be persuaded that such studies are within the range and the duty of statesmen. The Austrian Minister of Commerce has well stated it: "Statistics is no longer to be viewed as a mere theoretical science for the gratification of the learned, since, on the contrary, it subserves the practical ends of political society and lends its service to administration, as well in determining the lines of existing institutions and laws, as in weighing measures not yet carried out."

In the early collection of statistics for any State where there are no previous records as to vital facts which can be satisfactorily used, the first point is to collect as far as possible all facts which, in the judgment of statisticians, are likely to be useful in future inquiries. From many of these it would be futile to

attempt to make deductions until enough had been gathered through series of years and in different localities for legitimate comparisons. It is important on the one hand not to multiply items, and on the other not to omit such as are likely to be of service. There is much therefore to be transcribed which does not become immediately available. Yet that especially which relates to disease and death has easy and important lessons.

As comparisons need to be made with the tables of other cities, states and countries, some uniformity of method is to be sought. It was for this that at the late Statistical Conference a committee was appointed to review all forms and adjust them so as to make them comparable.

One of the effects of a central bureau should be to stimulate our larger cities to a close local study of their vital returns. It would require but little additional appropriation to that now required by State law, and would enable them to know the ward and street localities of disease, in such a way as to be of great practical service. The weekly rate of mortality is too often a mere item of news. But if the city board of health is studying it, and inquiring as to causes, experience fully shows that the result is the controlling of epidemics and the abatement of disease. Such large cities as Newark, Paterson, Trenton, Camden, etc., should certainly add to their health force, a method by which the weekly and ward returns can be studied, with the view of localizing the sources of disease, and so remedying existing evils.

METEOROLOGY.

The records of meteorology are imparted in the study of disease. For this, and other reasons, the State Board of Health endeavors to secure weather records at a few stations, which it is hoped may yet be studied in their bearings upon the health and diseases of the people. For the last two years our closest observers have seen much reason to connect prevalent epidemics with climatic conditions. The intensity of yellow fever seemed to have much to do with the notable atmospheric and telluric conditions of 1878–9. The great mildness of the last winter, followed by the almost summer heat of April and May, and the great drought which even interfered with corn-planting, seems to have had considerable relation to the prevalence of fevers,

especially of a periodic type. While we cannot vacate climate or control the seasons, such facts warn us that it is not safe to keep in store the materials for fermentive and putrefactive decay, either animal or vegetable. We should interrupt the results by seeing to that part which falls under our jurisdiction. Or if we have neglected so as to have the accumulations in such seasons, our only relief is to betake us to the mountains or the sea. Unfortunately, large portions of our population cannot do this, and are therefore interested in having healthy homes for all the year.

METHODS OF STUDYING STATISTICS.

While the English and Continental methods of dealing with statistics are valuable as guides, it is evident there needs some modification, when we come to deal with our changed populations. The tides of emigration and the migrations from State to State need to be taken into consideration.

Occupations, which in the technic methods of foreign trades give reliable data, are so often changed by our people that conclusions therefrom need to be studied in classes, rather than from general returns alone. The record of occupation at marriage is more reliable than to take the given occupation in the death certificate, since it is more likely to give the trade or chosen calling.

In the study of the effect of occupations on disease, we believe it will be found more practicable to follow out the history of named employes in specified industries for long periods, than to rely wholly on the death record.

In the study of nationality we have not only to do with the effects of heredity and race, but with the results always incident to emigration, both in the exposures of change and in the risks of acclimatization. Emigrants, for instance, fare badly who arrive in summer and fall and at once resort to crowded cities or to marshy districts. Even changes from one climate of our own country to another are not so desirable at such seasons.

In the study of the causes of pauperism, crime or dependency it would be valuable to know how many children are left in partial or complete orphanage under twelve. Some of these points have to be omitted lest the certificates become too prolix. Suggestions occasionally come to us as to additions to record, which

show an interest in the subject. The index is now in such a form as to be available to local health officers and statisticians who may need to study local questions.

STILL-BIRTH RETURNS.

The record of still-births, for obvious reasons, can never be entirely complete. But the value of the record, and the benefit to society, of the attempt to obtain the record, is already apparent. It is well known that many children perish not by evil intent, but by want of skilled attendance at the time of birth. Sometimes the mother, too, falls a victim, and living children are made orphans.

While we cannot advocate too stringent legislation, it is well when there is some restraint on carelessness, unskillfulness and neglect. We are already made aware by physicians that their aid is sooner sought in perilous cases, and that the general effect of the law is salutary. The highest interests of the people require that the sacredness of child-life should be felt, and that all criminal interference or all neglect at time of birth should be prevented, both by public sentiment and by proper enactment. As attempts at concealment rarely succeed, a record is but the authentication of orderly attendance. The neglect of it is the only ground of suspicion, except in the instances where the frequency of the misfortune in the hands of midwives gives rise to the fear that so-called experience, without educated skill is now and then a peril both to mother and child.

RELATIONS OF LOCAL BOARDS OF HEALTH TO VITAL STATISTICS.

Section five of the law of March 11, 1880, concerning the protection of the public health, directs local boards of health to take cognizance of any neglect to make vital returns on the part of those upon whom this duty devolves. When there is such neglect, the city clerk or assessor may at his discretion see the person or address the bureau of vital statistics, or make complaint to the local board of health. The local board may then insist upon the returns being made, or bring action for the neglect. While cases may occur in which either the local or the State authorities may need to appeal to the law, we do not believe there is any deliberate intent to neglect on the part of the negligent

Yet it is very important that full returns be secured. The local boards should therefore not fail, both by the weight of their influence, and by special committee, if need be, to secure this object. The importance of these returns in the study of local health conditions, and of the state of the population through series of years, has certainly not been over-estimated, and has been fully tested in many nations. These local boards should therefore insist upon the legal right which every one has to this record, as also upon the need of it for local health-information. A case has recently come to our notice in which the parents of a child had serious ground of complaint because the medical attendant had omitted the record. With our foreign population, especially, it may at any time cause such embarassment as to cause both parents and attendant equally to regret the oversight.

The whole number of deaths reported from July 1, 1879, to July 1, 1880, is 18,967, against 20,440 for the previous year, being a record of deaths of 1,473 less than for the year ending July 1, 1874.

A general comparison shows that while there has been some diminution in the class generally known as zymotic, it has not been quite in proportion to the aggregate decrease. We shall briefly notice those diseases which appear in the special schedule.

REMITTENT FEVER.

This has a record of 293 against 268 cases of last year. The death record of this fever is generally accurate, with the exception that there is some doubt as to the placing of fevers returned as typho-malarial. These are usually placed with typhoid fevers, since it is the predominence of this element that usually leads to this nomenclature. It is well, however, in comparison, to pay some attention to the comparative record of typhoid fever. The greater prevalence of malarial disease commenced in the summer of 1878 and was intensified in 1879 and still worse in the summer and fall of 1880. In 1860 and 1861 the State Medical Society made a careful inquiry into the division of miasmatic diseases, now generally called malarial. They were found, at that time, not to be generally prevalent in the State. The years 1855 to 1858 had shown a large prevalence of this class of fevers. Since then no record of the disease has been so extended as for the past two years.

One cannot study the mortality record, and especially by the light of the reports of local boards of health, without perceiving that this period has been characterized to an unusual degree by these periodic fevers. The increased number of remittent and typho-malarial fevers proving fatal, stands for a large number of cases in such a class of disease. Other evidence also shows itself in certificates or reports, even where the record of death does not reveal the great disturbing element; while in such periods the influence of malaria is more extended, yet its points of concentrated powers are not less readily distinguishable. The borders of sluggish, impeded streams, where there is much waste material accumulated, stagnant or artificial lakes and ponds and marshy districts are the breeding places and the haunts of this prolific poison. The finding of a mosquito, or a swarm of them, on the mountain top does not deceive us as to its habitat. As little doubt is there as to the homes and resorts of what has so long been called paludal or marsh fever. Until we shall have secured some general law for drainage, and guard against the collection of great deposits of vegetable matter where moisture, heat and varying exposure ferment and putrefy it, we may expect a malarial influence which will make its mark on the general health of our population and upon family thrift, more than is merely tabulated in one of the varied forms of the disease. Many a constitution is so impaired as to find record afterward in untimely death by other diseases.

TYPHOID FEVER.

This numbers 373 cases, or an excess of 49 cases over the previous year. It is more identified with houses in close vicinage, and results largely from sewers, impure water and human excreta. Just as this report is being printed, a series of cases are occurring in an alms-house in Camden county, where typhus, as a well declared disease, is to be found. A fuller account will appear in the next report. It cannot be concealed, that malarial fevers are more frequent in some cities than formerly, and that we need closely to study the relations of the remittent and typhoid poisons with a view to their diminution, as also to determine the results of their united action on the same individual, or their possible combinations of influence upon the

atmosphere. We shall, ere long, be able to compare cities among themselves and rural and city districts, to see if a more accurate law as to prevalence can be substantiated.

SMALL-POX.

Last year we had not occasion to record a single death, although a very few cases occurred. This year we have also record of sporadic cases in localities where no death has occurred. There were several cases and some deaths in Salem city.

The chief epidemic has been in Camden city. As but few of the deaths occurred before July, the chief record will be in the next report. The authorities were tardy in dealing with the first cases of the disease and in securing general vaccination. When preventive measures were entered upon with vigor the cases and the mortality were diminished. Many of our cities still choose to repeat the experiment of waiting for an epidemic in order to secure general vaccination. The consequence is, that just as fast as a new crop of children can be found between five and ten years of age, the small-pox is sure to find material enough upon which to flourish. Some false conclusions are thus drawn as to the tendency of epidemics to occur at stated intervals of about seven years. We need much a public opinion which will consider neglect of vaccination a wrong, and which will at least compel it in the case of all identified with public schools. Because education is free that ought not to give the right to parents to make small-pox a free gift also. They are under obligations not thus to expose the children of others, while availing themselves of an educational gift, intended to be for all. The use of bovine virus removes the fear or prejudice as to human vaccine, but there is need that its source be assured, lest dishonest dealers substitute the human for the bovine lymph. We are at present making some inquiries into the reliability of supply and the care taken by those who advertise to furnish it fresh and pure each week.

SCARLET FEVER

has not been so prevalent as the former year, registering 573 instead of 627 deaths. Some of these latter must be associated with the epidemic of the former year. While no antidote exists

to the poison, isolation, avoidance of close rooms, proper airing and disinfection do much to limit the disease. Where a case occurs in a family, many now adopt a prophylactic treatment for other members of the household.

Cleansing gargles and washes have their sphere of use upon individuals, as well as upon surroundings of the patient, and internal remedies seem often to avail. No disease needs more careful and skillful care on part of the attendants, and there is no good reason why so many cases should occur.

MEASLES.

This ranks next to small-pox as the most contagious of the exanthems or skin zymotics. Although it is sometimes attended with a large rate of mortality, only 87 deaths from it are recorded this year, as against 77 of last year. It now seems strange to us that scarlet fever could ever have been classified with it. It is not strange that röthlen, or the so-called German measles, is sometimes taken for it, and so two attacks credited oftener than should be. It is a disease whose study is most important both in itself and in its bearing on acute and chronic lung affections.

WHOOPING COUGH,

has a mortality of 277, or 140 more than the previous year. In England it has, within the last three years, registered a much larger death rate than usual. It is one of those diseases which is probably often conveyed by the spittle or mouth secretions, which should not be concealed in handkerchief but find their place in some vessel having a disinfectant solution in it. It is largely under the control of medicine, and often neglected by parents with the idea that it is not dangerous. Even in recovery the lungs are often impaired by the dilitation which the air tubes or cells have suffered.

CROUP AND DIPHTHERIA,

the last year numbered 873 instead of 1,100 deaths; but the total is distressingly high. The observations of Wood and others seem to show that it is peculiarly a septic disease and depends much for its mortality, as well as, perhaps, for its inception,

upon abnormal and specific decomposition. Heat, moisture and filth fructify many kinds of disease and have very marked influence on the disease.

It is probable we shall yet find that sewer gas is not the chief factor, as it is a disease of the country as well as of cities, and that spores or animalculæ which flourish out of sunlight and in damp houses and amid peculiar atmospheric conditions, have much to do with the frequency and violence of the malady.

We think it is becoming more and more evident that croup and diphtheria do not differ in their pathological results, although difference arises from the seat and degree of exudation, and as to the local and constitutional character of certain epidemics.

DIARRHŒAL DISEASE,

showed an increase of three hundred and seventeen over the previous year. Both summers have been remarkable for high temperature and for certain conditions of humidity. There are so many factors that enter into the causation of diarrhœal disease as to render it necessary to study cities and country, and different cities, in comparison, with the inferences for a State aggregate.

CONSUMPTION.

The record of last year was 1,849 deaths; of this year, 2,166. It is high time that this disease took a more conspicuous place in the study of preventible diseases. The number of its victims is far greater than the usual feared diseases of children, while it generally removes those further advanced to adult life. The cure of the disease solely by medical treatment has not made great progress of late. But it is quite different as to our knowledge of causes and our powers of limiting the tendencies thereto. Damp soils and sudden changes of temperature are known as exciting causes. Acute and chronic pneumonia not infrequently start the tubercular deposit or prepare the system for its activity.

The law of heredity is better understood, so that by proper dealing with the child the tendency is overcome.

Air fouled either by gases or organic particles, or laden with fine dust of any kind, when breathed into the lungs is more or less an irritant. Where there is in it nothing to induce specific disease, both by lowering the tone of the system and by its local

irritation amid the delicate structures of the lungs, it gives rise to conditions favorable either to tubercular deposit or to the development of disease, of which the initial plasm is already deposited. Hence, there is no disease more worthy of the close study of the sanitarian, and of every one who would remove more fully from the risks of life one of its greatest perils, both from their own relation and from their own excessive mortality.

ACUTE LUNG DISEASE

also needs the sure, close study and observation. The record is 1,988, or 172 less than the former year. Adding these to the deaths by consumption, we have for lung disease an aggregate of 4,154, making over one-fourth of all of the diseases of special classes and over one-fifth of all the fatal diseases of the State. Surely in a State of such large industrial and factory development, political and social economy require us to look well to this deterioration of stock and vigor, as well as to the actual number of deaths. The deaths from the

BRAIN AND NERVOUS DISEASES

of children numbered 1,638, or 9 more than the previous year. This includes the large number of which convulsions form a frequent symptom. Adding to these 1,347 of adult brain diseases, an increase of 33 over the former year, and forming an aggregate of 2,985, it is well worthy of study how far the immense tax of this active age is increasing the liability to shock upon that high nervous organization with which mankind is endowed.

THE HEART AND CIRCULATION,

numbering 982, or an increase of 10 over the previous year, is also worthy of study in the same direction.

It is well known to physicians that rheumatism is often the excitant of heart disease, by the changes produced in the valves of the heart during its attack. Of this 66 deaths were recorded this year and 76 the previous year. From the fact that few die from acute rheumatism directly, the mortality it causes through heart disease is overlooked. It is now believed that the early and free use of salicylic acid in the beginning of the acute stage,

will often prevent those structural charges on the heart, which in later life produce death. If so we should ere long find a diminution of heart disease from this cause,

URINARY DISEASE.

These are marked by us in the office schedules so as to distinguish between those of the kidney and the bladder. Most of those tabulated come under disease of the kidney, and is generally returned as Nephritis or Bright's Disease. The studies of this disease have not merely reference to this one organ, for the lesion is often only secondary to disease of the brain, or nervous system, to failure in the digestive efforts, and to the use of intense irritants, of which alcohol and the various highly seasoned sauces are the representatives.

CANCER.

The gradual increase of cancer, as a constitutional and distinctive disease, has been noted in the English returns and seems repeated in our own experience. Four hundred and twenty-five cases of the disease may seem small when compared with some of the other diseases; but it is believed to be more uniformly transmitted to offspring than almost any other malady and has an intricacy of history, as to causation and extension, that render it a subject for close study. We are watching, with interest, some returns that seem to indicate its more frequent occurrence in some sections than others, but it is too soon to even speak of probabilities.

PUERPERAL FEVER

claimed about sixty more victims this year than the last. The loss of a mother too often means a bereft household of little ones, whose orphanage is an affliction not only to the father but to society. The undoubted evidence we have of the communicability or portability of this disease, and its relations to erysipelas call for its closest study in the interests of State hygiene.

We desire to direct the attention of all those interested in Vital Statistics, to the importance of comparisons of cities and the country as to these various diseases, and also to comparison of various other districts with each other as preparatory to that

more extended study which will be desirable, when the number of data will exclude those sources of error which are not eliminated in small comparisons. Many of our physicians, as well as other citizens, are already seeing how important are the records thus secured. While there will be some crude deductions and inferences even on the part of those who lay claim to something of expert skill, yet it is enough that where the study has been most profound and the criticism the most searching, there the results have been most satisfactory. The social statist, no less than the physician looks to such records, as the mariner looks to his chart. With all the possibilities of error he knows that experience verifies the credibility of this great numerical map of population, and with graphic outlines works out the destines of families, of races, and of nations. The true student is led less and less to doubt the claim which it has to a place among determinable sciences and positive arts, while he may well question his own ability to grapple with the solution of the great life problems which are involved. The best encouragement of present progress in all directions is that material is being collected which will be of indispensable importance to great social, industrial and life studies, of which more than a preface is already at hand.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS BY TOWNSHIPS.

Atlantic County.

	M.	B.	D.
Absecon	8	18	7
Atlantic City	33	120	93
Buena Vista	4	13	9
Egg Harbor City	20	44	28
Egg Harbor Township	15	52	72
Galloway	12	50	37
Hamilton	7	85	28
Hammonton	14	41	17
Mullica	2	12	12
Weymouth	0	16	11
	115	401	314

Bergen County.

	M.	B.	D.
Englewood	15	53	73
Franklin	12	28	20
Harrington	9	59	14
Hohokus	24	56	27
Lodi	20	101	63
Midland	5	34	25
New Barbadoes	46	137	79
Palisade	8	42	32
Ridgefield	15	53	41
Ridgewood	14	41	24
Saddle River	2	14	21
Union	8	68	50
Washington	15	62	41
	193	748	510

Burlington County.

	M.	B.	D.
Bass River	10	28	15
Beverly	26	82	54
Bordentown	47	124	90
Burlington	57	135	118
Chester	27	72	88
Chesterfield	8	27	24
Cinnaminson	13	66	41
Delran	5	12	12
Evesham	7	86	17
Eastampton	8	2	0
Florence	9	43	33
Little Egg Harbor	18	44	16
Lumberton	7	27	20
Mansfield	10	35	30
Medford	13	55	29
Mt. Laurel	1	23	17
New Hanover	14	45	28
Northampton	50	96	78
Pemberton	22	74	62
Randolph	1	13	5
Shamong	2	11	11
Southampton	21	38	24
Springfield	6	33	13
Washington	1	15	7
Westampton	1	27	14
Willingboro	2	18	10
Woodland	2	8	8
	378	1174	799

Camden County.

	M.	B.	D.
Camden City	424	716	808
Centre	12	68	41
Delaware	3	21	13
Gloucester	20	61	72
Gloucester City	41	140	84
Haddon	22	55	47
Stockton	29	52	62
Waterford	21	40	25
Winslow	6	56	37
	578	1204	1184

Cape May County.

	M.	B.	D.
Cape May City	22	57	24
Dennis	7	18	11
Lower	18	64	27
Middle	14	68	87
Upper	17	80	27
	78	232	126

Cumberland County.

	M.	B.	D.
Bridgeton	129	205	155
Commercial	9	13	81
Deerfield	10	81	16
Downe	11	23	18
Fairfield	25	77	84
Greenwich	7	17	19
Hopewell	18	81	28
Landis	55	112	98
Maurice River	10	49	36
Millville	90	201	174
Stoe Creek	0	24	12
	359	783	611

Essex County.

	M.	B.	D.
Bellville	16	54	45
Bloomfield	28	117	81
Caldwell	15	42	36
Clinton	22	46	38
East Orange	34	164	101
Franklin	11	32	21
Livingston	2	19	18
Millburn	18	30	20
Montclair	40	120	81
Newark	1141	3518	2558
Orange	108	429	216
South Orange	20	86	49
West Orange	12	42	41
	1462	4699	3295

Gloucester County.

	M.	B.	D.
Clayton	28	57	34
Deptford	4	40	22
Franklin	18	60	34
Glassboro	15	70	30
Greenwich	16	70	52
Harrison	14	75	27
Logan	6	20	19
Mantua	7	40	23
Monroe	5	35	35
Washington	14	44	18
West Deptford	4	30	26
Woodbury	28	52	27
Woolwich	16	45	28
	165	638	375

Hudson County.

	M.	B.	D.
Bayonne	32	190	141
Guttenberg	10	11	27
Harrison	6	182	129
Hoboken	193	784	784
Jersey City	705	1523	2533
Kearney	8	35	24
North Bergen	9	34	164
Town of Union	45	142	121
Union	3	15	29
Weehawken	3	15	35
West Hoboken	14	143	83
	1023	3024	4025

Hunterdon County.

	M.	B.	D.
Alexaudria	8	30	17
Bethlehem	10	37	45
Clinton	7	38	11
Delaware	24	58	31
East Amwell	12	35	24
Franklin	12	28	17
Frenchtown	13	19	10
High Bridge	14	50	21
Holland	8	45	28
Kingwood	1	44	15
Lambertville	42	79	78
Lebanon	33	52	36
Raritan	30	64	43
Readington	21	72	40
Tewksbury	23	40	19
Town of Clinton	9	11	12
Union	7	17	10
West Amwell	2	20	18
	276	739	475

Mercer County.

	M.	B.	D.
Chambersburg	39	98	109
East Windsor	17	43	35
Ewing	6	23	30
Hamilton	20	61	54
Hopewell	33	88	41
Lawrence	14	59	47
Princeton	24	105	81
Trenton	326	563	618
Washington	6	15	18
West Windsor	6	16	15
	491	1071	1048

Middlesex County.

	M.	B.	D.
Cranberry	20	33	28
East Brunswick	17	92	48
Madison	4	17	22
Monroe	27	50	44
New Brunswick	116	453	269
North Brunswick	11	27	20
Perth Amboy	22	204	83
Piscataway	26	70	46
Raritan	19	50	46
Sayreville	1	17	26
South Amboy	15	61	52
South Brunswick	18	56	49
Woodbridge	10	80	44
	301	1210	777

Monmouth County.

	M.	B.	D.
Atlantic	9	24	6
Eatontown	28	52	41
Freehold	54	77	67
Holmdel	7	21	13
Howell	29	74	44
Manalapan	12	38	34
Marlboro	10	38	27
Matawan	18	62	48
Middletown	24	93	62
Millstone	24	43	34
Neptune	38	88	63
Ocean	46	156	83
Raritan	42	87	61
Shrewsbury	52	139	73
Upper Freehold	19	56	49
Wall	48	121	47
	460	1169	752

Morris County.

	M.	B.	D.
Boonton	28	88	43
Chatham	14	69	74
Chester	15	64	23
Hanover	14	54	41
Jefferson	6	41	27
Mendham	11	28	21
Montville	6	23	10
Morris	89	180	128
Mount Olive	22	55	26
Passaic	5	82	16
Pequannock	18	47	27
Randolph	61	140	108
Rockaway	47	168	90
Roxbury	13	47	33
Washington	11	76	18
	310	1012	685

Ocean County.

	M.	B.	D.
Berkeley	3	15	12
Brick	21	56	42
Dover	17	49	24
Eagleswood	5	15	7
Jackson	14	36	19
Lacey	12	19	7
Manchester	7	29	11
Ocean	2	8	3
Plumsted	9	49	16
Stafford	9	25	8
Union	4	18	13
	103	319	162

Passaic County.

	M.	B.	D.
Acquackanonk	4	85	28
Little Falls	9	17	81
Manchester	2	18	18
Passaic	49	216	142
Paterson	431	1322	1174
Pompton	34	40	21
Wayne	6	23	22
West Milford	31	75	37
	566	1741	1468

Salem County.

	M.	B.	D.
Elsinboro	0	12	11
Lower Alloways Creek	15	11	17
Lower Penn's Neck	20	25	29
Mannington	2	58	49
Pilesgrove	26	62	48
Pittsgrove	11	67	16
Quinton	2	46	20
Salem	33	83	76
Upper Alloways Creek	15	44	23
Upper Penns' Neck	24	97	52
Upper Pittsgrove	8	20	21
	156	525	362

Somerset County.

	M.	B.	D.
Bedminster	18	44	22
Bernards	14	59	85
Branchburg	5	27	19
Bridgewater	66	170	104
Franklin	17	60	55
Hillsborough	11	63	44
Montgomery	16	51	18
North Plainfield	7	71	86
Warren	8	19	10
	162	564	343

Sussex County.

	M.	B.	D.
Andover	7	21	8
Byram	20	30	17
Frankford	15	26	25
Greene	1	8	8
Hardyston	14	21	39
Hampton	2	15	9
Lafayette	19	8	8
Montague	5	21	16
Newton	25	53	30
Sandyston	9	24	16
Sparta	18	27	28
Stillwater	17	21	19
Vernon	9	4	14
Walpack	5	17	5
Wantage	16	25	42
	177	321	284

Union County.

	M.	B.	D.
Clark	2	....	2
Cranford	8	10	11
Elizabeth	158	679	440
Fanwood	6	20	16
Linden	5	45	28
New Providence	6	9	11
Plainfield	57	166	98
Rahway	59	182	116
Springfield	6	19	23
Summit	8	40	27
Union	4	48	28
Westfield	14	48	40
	828	1216	840

Warren County.

	M.	B.	D.
Allamuchy	1	4	6
Belvidere	26	41	81
Blairstown	6	42	12
Franklin	21	85	20
Frelinghuysen	11	20	14
Greenwich	18	66	52
Hackettstown	15	46	29
Hardwick	2	12	7
Harmony	4	81	12
Hope	9	81	20
Independence	12	20	12
Knowlton	7	41	19
Lapatcong	4	43	22
Mansfield	9	85	29
Oxford	28	130	78
Pahaquarry	0	10	4
Phillipsburg	58	208	126
Town of Washington	24	55	28
Washington	5	20	11
	260	890	632

Totals of Marriages, Births and Deaths for all the Counties.

	M.	B.	D.
Atlantic	115	401	314
Bergen	193	748	510
Burlington	378	1174	799
Camden	578	1204	1184
Cape May	73	232	126
Cumberland	359	783	611
Essex	1462	4699	3295
Gloucester	165	638	375
Hudson	1023	3024	4025
Hunterdon	276	739	475
Mercer	491	1071	1048
Middlesex	301	1210	777
Monmouth	460	1169	752
Morris	310	1012	685
Ocean	103	319	162
Passaic	566	1741	1468
Salem	156	525	362
Somerset	162	564	343
Sussex	177	321	284
Union	328	1216	840
Warren	260	890	532
Total for the State.	7936	23680	18967

Summary of Totals for whole State for the past three years.

	M.	B.	D.
1878*	5375	19427	14085
1879	7096	23116	20440
1880	7936	23680	18967

*Under former law.

Return of Deaths from all Causes and certain specified Diseases, in the Counties of the State of New Jersey, for the year ending June 30th, 1880.

COUNTIES OF NEW JERSEY.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.	Total deaths from these diseases.	Death rate per 1000 from these diseases.
Atlantic	90	42	29	76	75	2	314	18,706	16.78	......	1	......	1	......	2	11	52	48	19	19	12	5	29	1	29	10	1	4	....	....
Bergen	110	67	50	172	107	4	510	36,790	13.86	22	7	......	10	1	4	10	46	94	58	38	25	18	40	5	31	14	......	6	....	....
Burlington	165	93	77	224	230	10	799	55,403	14.42	8	16	1	4	......	5	53	68	150	60	47	61	30	59	10	52	15	5	13	....	....
Camden	338	168	115	347	206	10	1,184	62,941	18.81	11	35	10	13	1	9	45	185	168	108	87	61	24	78	2	53	30	1	11	....	....
Cape May	37	19	17	22	29	2	126	9,765	12.90	1	4	......	8	......	3	7	21	12	8	13	1	3	11	1	10	7	1	......	....	....
Cumberland	148	90	43	160	165	5	611	37,694	16.20	2	13	......	18	......	5	36	65	106	71	37	28	9	45	2	38	17	3	7	....	....
Essex	800	461	286	1,130	613	5	3,295	189,819	17.35	67	90	......	43	7	15	172	384	511	413	303	165	110	239	16	143	76	7	39	....	....
Gloucester	91	47	32	103	98	4	375	25,886	14.48	6	13	......	7	1	2	21	35	45	39	19	25	8	28	1	33	7	3	2	....	....
Hudson	1,034	812	407	1,287	478	7	4,025	187,950	21.41	86	50	......	211	34	25	237	486	516	448	532	183	114	177	22	162	67	12	54	....	....
Hunterdon	75	52	51	134	158	5	475	38,568	12.31	2	14	......	8	......	4	36	39	67	43	11	43	8	54	1	28	13	3	3	....	....
Mercer	219	120	119	331	235	24	1,048	58,058	18.05	5	19	......	88	3	7	13	91	174	85	63	53	23	87	6	72	20	3	13	....	....
Middlesex	201	93	75	213	191	4	777	52,286	14.86	16	11	......	8	6	2	36	87	102	83	47	37	25	54	6	38	23	1	5	....	....
Monmouth	195	87	56	193	206	15	752	55,535	13.54	1	8	......	6	......	5	22	102	128	44	57	42	24	59	2	56	15	2	15	....	....
Morris	143	86	52	210	185	9	685	50,867	13.26	20	10	......	10	10	7	18	60	87	91	43	42	21	80	4	40	20	4	14	....	....
Ocean	33	16	14	50	48	1	162	14,455	11.20	1	4	......	1	......	4	6	12	28	11	6	6	1	17	2	18	5	2	2	....	....
Passaic	377	288	182	395	220	6	1,468	68,716	21.36	12	22	......	85	22	11	70	238	180	146	137	64	32	72	11	56	28	3	19	....	....
Salem	76	33	39	98	110	6	362	24,580	14.72	2	8	3	2	......	2	15	29	49	46	16	11	8	38	7	24	12	2	6	....	....
Somerset	71	31	22	99	118	2	343	27,161	12.62	5	2	......	2	......	1	4	28	44	39	21	29	15	34	5	28	11	5	4	....	....
Sussex	39	30	39	81	92	3	284	23,553	12.05	7	12	......	15	......	......	8	11	38	37	21	15	5	35	1	12	8	2	5	....	....
Union	204	109	61	261	200	5	840	55,571	15.11	15	18	1	3	2	12	32	86	115	83	60	51	17	73	2	45	21	2	15	....	....
Warren	120	97	50	139	117	9	532	36,588	14.54	4	16	......	30	......	5	21	41	50	56	61	30	16	38	2	37	6	2	7	....	....
	4,566	2,841	1,816	5,725	3,881	138	18,967	1130,892	16.77	293	373	15	573	87	130	873	2166	2714	1988	1638	982	516	1347	109	1005	425	64	244	15,542	13.74

Return of Deaths from all Causes and certain specified Diseases, in the Cities of the State of New Jersey, of over 5,000 for the year ending June 30th, 1880.

Incorporated Cities of the State having by the Census of 1880 over 5,000. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.	Total deaths from these diseases.	Death rate per 1000 from these diseases.
Burlington Co.																														
Bordentown	14	10	10	29	27	......	90	5,334	16.89	......	1	......	......	......	1	1	9	24	6	11	9	4	4	......	5	1	......	2	....	....
Burlington	22	18	12	36	22	3	113	7,237	15.61	......	1	......	1	......	......	3	12	28	12	5	5	8	8	2	4	......	1	1	....	....
Camden Co.																														
Camden	226	131	85	246	106	9	803	41,658	19.27	6	25	10	9	1	7	37	120	115	71	66	37	17	51	......	25	24	1	6	....	....
Gloucester City	28	14	6	22	14	......	84	5,347	15.70	......	1	......	......	......	1	6	18	17	5	6	3	......	5	......	3	1	......	1	....	....
Cumberland Co.																														
Bridgeton	48	15	11	43	38	......	155	8,729	17.75	......	2	......	4	......	3	9	21	28	14	9	6	4	10	2	6	3	1	4	....	....
Millville	39	55	15	38	24	3	174	7,660	22 71	......	2	......	13	......	......	21	28	36	22	10	3	3	6	......	8	1	1	......	....	....
Essex Co.																														
East Orange	22	10	13	26	30	......	101	8,349	12.09	2	7	......	1	1	......	3	11	15	11	4	8	4	4	2	4	......	......	4	....	....
Newark	641	373	222	899	414	4	2,553	136,400	18.71	48	72	......	35	3	11	144	298	396	308	251	121	82	178	5	115	62	5	27	....	....
Orange	55	30	22	77	32	......	216	13,206	16.35	2	3	......	2	1	1	3	39	47	37	16	6	4	13	2	10	4	......	1	....	....
Hudson Co.																														
Bayonne	37	33	2	53	16	......	141	9,372	15.04	1	......	......	3	......	2	10	19	22	14	16	5	1	5	1	6	3	......	2	....	....
Hoboken	208	150	64	244	68	......	734	30,999	23.71	5	8	......	23	5	6	49	107	76	93	192	37	27	28	7	29	12	3	13	....	....
Jersey City	644	525	267	798	295	4	2,533	120,728	20.98	57	31	......	148	23	16	164	292	344	269	265	114	66	109	12	101	35	8	31	....	....
West Hoboken	27	14	8	25	14	......	88	5,441	16.17	1	2	......	3	......	......	4	9	7	8	16	8	1	1	......	6	3	1	1	....	....
Harrison	30	17	14	53	13	2	129	5,510	23.41	7	2	......	1	1	......	......	11	20	19	12	6	3	6	......	5	2	......	2	....	....
Town of Union	26	41	17	23	14	......	121	5,849	20.04	4	2	......	17	3	......	5	14	12	9	14	4	3	7	......	4	3	......	1	....	....
Mercer Co.																														
Trenton	138	75	75	196	118	16	618	29,910	20.66	5	5	......	66	1	2	6	54	108	43	40	31	16	38	3	33	11	3	7	....	....
Chambersburg	25	14	19	38	9	4	109	5,437	20.04	......	5	......	14	1	2	2	9	17	12	7	3	......	6	1	7	2	......	1	....	....
Middlesex Co.																														
New Brunswick	93	32	24	65	55	......	269	17,167	15.66	2	6	......	1	6	......	8	45	36	27	24	14	9	17	4	13	11	......	1	....	....
Morris Co.																														
Morristown	22	11	6	52	36	1	128	6,838	18.71	2	......	......	......	......	......	4	17	19	9	6	6	5	34	......	5	3	1	......	....	....
Passaic Co.																														
Passaic City	43	26	13	44	14	2	142	6,532	21.73	1	2	......	1	......	......	10	22	14	13	22	8	3	3	3	8	1	......	4	....	....
Paterson	305	247	152	296	170	4	1,174	50,877	23.07	7	20	......	82	22	11	56	202	152	119	101	48	24	62	3	37	22	2	12	....	....
Salem Co.																														
Salem	23	8	10	18	16	1	76	5,057	15.02	......	1	......	......	......	2	8	10	8	8	1	......	......	8	......	6	......	......	3	....	....
Union Co.																														
Elizabeth	110	74	36	131	86	3	440	28,229	15.58	5	6	......	2	2	9	24	52	49	44	39	24	7	35	......	21	11	1	7	....	....
Plainfield	24	9	10	36	18	1	98	8,126	12.06	2	4	......	......	......	......	2	13	19	9	7	5	3	9	......	5	1	1	3	....	....
Rahway	32	8	5	34	37	......	116	6,454	17.97	2	......	......	......	......	2	1	9	26	12	6	7	......	10	1	15	5	......	1	....	....
Warren Co.																														
Phillipsburg	39	25	21	21	20	......	126	7,180	17.54	......	2	......	15	......	3	11	9	11	6	22	3	2	10	......	10	1	......	1	....	....
	2,921	1,963	1,139	3,543	1,706	57	11,331	583,626	19.41	159	210	10	441	70	79	591	1450	1646	1200	1168	521	296	667	48	491	222	28	136	9,433	18.15

Death Rate per 1000 *of Counties, Based on Census of* 1880, *for period from June* 30*th*, 1878 *to June* 30*th*, 1879.

(As the present census affords the most correct estimate of population for the previous year, we give a re-calculation of the death rate for the year ending July 1st, 1879, on this basis, in order to aid in future comparisons.)

COUNTIES.	Deaths.	Population.	Death rate, per 1000.
Atlantic	302	18,706	16.14
Bergen	636	36,790	17.28
Burlington	989	55,403	17.85
Camden	1,059	62,941	16.82
Cape May	120	9,765	12.29
Cumberland	628	37,694	16.66
Essex	3,947	189,819	20.79
Gloucester	431	25,886	16.64
Hudson	3,957	187,950	21.05
Hunterdon	527	38,568	13.66
Mercer	1,109	58,058	19.10
Middlesex	837	52,286	16.00
Monmouth	926	55,535	16.67
Morris	829	50,867	16.29
Ocean	217	14,455	15.01
Passaic	1,287	68,716	18.72
Salem	392	24,580	15.94
Somerset	429	27,161	15.79
Sussex	330	23,553	14.01
Union	966	55,571	17.38
Warren	522	36,588	14.26

Death rate per 1000 of whole State	**18.07**
Death rate per 1000 of specified diseases	**13.96**

Death Rate per 1000 *of Cities, Based on Census of* 1880, *for period from July* 1*st*, 1878 *to July* 1*st* 1879.

CITIES.	Deaths.	Population.	Death rate, per 1000.
Burlington county.			
Bordentown	86	5,334	16.12
Burlington	154	7,237	21.27
Camden county.			
Camden	673	41,658	16.15
Gloucester City	72	5,347	13.46
Cumberland county.			
Bridgeton	133	8,729	15.23
Millville	137	7,660	17.88
Essex county.			
East Orange	126	8,349	15.09
Newark	3,116	136,400	22.84
Orange	215	13,206	16.28
Hudson county.			
Bayonne	156	9,372	16.64
Hoboken	669	30,999	21.58
Jersey City	2,517	120,728	20.84
West Hoboken	95	5,441	17.46
Mercer county.			
Trenton	653	29,910	21.83
Middlesex county.			
New Brunswick	325	17,167	18.93
Morris county.			
Morristown	114	6,838	16.67
Passaic county.			
Paterson	994	50,877	19.53
Union county.			
Elizabeth	472	28,229	16.72
Plainfield	130	8,126	15.99
Rahway	169	6,454	26.18
Warren county.			
Phillipsburg	102	7,180	14.20

Return of Deaths from all Causes, and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of ATLANTIC. Population.........18,706. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.
Absecon	1			3	3		7	507	
Atlantic City	38	12	5	22	16		93	5,477	16.98
Buena Vista	2	1	1	3	2		9	885	
Egg Harbor City	7	6		0	9		28	1,232	
Egg Harbor Township	22	11	5	15	10		72	*3,570	
Galloway	9	5	3	12	8		37	‡2,337	
Hamilton	8	1	6	8	5		28	1,464	
Hammonton	1	1	4	2	7	2	17	1,776	
Mullica	1	3	3	3	2		12	717	
Weymouth	1	2	2	2	4		11	741	
Death rate per 1000 of county									16.78
Death rate per 1000 of county, exclusive of cities over 5000									16.70
	90	42	29	76	75	2	314		

Statistical Divisions	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Absecon							1		2					2		1			1
Atlantic City		1			1			24	11	2	8	4	3	3	1	7	4		1
Buena Vista									1	1		1		2		1			
Egg Harbor City						1	1	4	1	3	1			3		2			1
Egg Harbor Township							2	16	15	3	4	4	1	7		6	1		
Galloway				1		1		4	7	2	2	1		2		7	2	1	
Hamilton							3	2	2	3	2	1	1	3		1	1		1
Hammonton							2	1	4	3				3		3	2		
Mullica							1		4	1	2			1			1		
Weymouth							1	2	1	1		1		3		1			
Death rate per 1000 of county																			
Death rate per 1000 of county, exclusive of cities over 5000																			
		1		1	1	2	11	52	48	19	10	12	5	29	1	29	11	1	4

*Exclusive of Absecon.

‡Exclusive of Egg Harbor city.

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of BERGEN. Population.........36,790 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Englewood	16	16	7	21	12	1	73	4,078	......	2	1	......	2	......	1	2	12	9	12	7	5	2	3	......	4	1	......	3
Franklin	3	3	4	5	4	1	20	2,206	......	......	......	......	......	......	......	3	1	5	3	2	1	1	1	......	......	1	......	......
Harrington	2	......	......	7	5	......	14	2,570	......	......	......	......	1	......	......	......	1	5	......	......	......	......	4	......	1	......	......	......
Hohokus	7	2	2	8	7	1	27	2,920	......	......	......	......	1	......	......	1	1	7	2	......	......	2	4	......	2	1	......	......
Lodi	18	8	6	18	13	......	63	4,071	......	2	2	......	......	......	......	2	9	6	8	7	2	3	4	2	3	4	......	......
Midland	4	2	2	13	4	......	25	1,591	......	1	......	......	......	......	......	......	2	6	1	1	3	......	5	......	2	......	......	......
New Barbadoes	20	11	10	24	14	......	79	4,250	......	1	......	......	1	......	......	......	7	16	11	8	3	5	7	1	7	1	......	......
Palisade	4	2	5	12	9	......	32	2,303	......	3	......	......	......	......	1	......	1	5	3	1	3	1	......	1	3	3	......	2
Ridgefield	8	5	3	16	9	......	41	3,933	......	2	......	......	1	......	......	......	3	7	8	3	3	1	2	......	1	......	......	......
Ridgewood	2	4	6	7	5	......	24	1,478	......	2	1	......	1	......	1	1	......	6	3	1	1	1	1	1	2	......	......	......
Saddle River	3	9	2	4	3	......	21	1,355	......	......	......	......	3	......	......	......	3	3	......	2	2	......	......	......	......	1	......	......
Union	17	3	3	14	13	......	50	3,164	......	6	2	......	......	1	......	......	6	7	2	4	1	2	2	......	4	......	......	......
Washington	6	2	......	23	9	1	41	2,853	......	3	1	......	......	......	1	1	......	12	5	2	1	......	7	......	1	2	......	1
Death rate per 1000 of county	......	......	......	......	......	......	......	......	13.86	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	110	67	50	172	107	4	510	......	......	22	7	......	10	1	4	10	46	94	58	38	25	18	40	5	31	14	......	6

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of BURLINGTON. Population 55,403. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Bass River	8		1	3	3		15	1,006			1						2	3		1	1		2			1		
Beverly	2	4	3	1	4		14	†1,369		1					1	5			2		1				2	1		
Beverly City	6	10	6	4	13	1	40	1,759								17	4	2	3		3		1		1	2		
Bordentown	14	10	10	29	27		90	5,334	16.89		1				1	1	9	24	6	11	9	4	4		5	1		2
Burlington	22	18	12	36	22	3	113	7,237	15.61		1		1			3	12	28	12	5	5	8	8	2	4		1	1
Chester	9	4	2	9	12	2	38	2,855		1			1			1		1	1	7	5	1	2		6			1
Chesterfield	3	1	3	6	10	1	24	1,525							1			6		1	1	2	4	2				1
Cinnaminson	7	6	7	6	14	1	41	2,184								9	1	6	2		1	1	2	1	4		1	1
Delvan	2	5	2	2	1		12	1,760								6			1		2	1						
Evesham	2	2		7	6		17	1,602			1					1		5		1	3		2		2			
Florence	7	5	4	11	5	1	33	1,528		1	1		1		1	1	4	8	5	1	4	1	1				1	1
Little Egg Harbor	4		3	4	4		16	1,881								1	1	2	3		1		2	1	2			
Lumberton	4	3	2	6	5		20	1,689		1						1	2	2		1		1			2	4		
Mansfield	7		1	13	8	1	30	1,648		1	3				1		1	7	1	1	1	2	8		2	1		
Medford	7	1		10	11		29	1,980		1							4	6	4			1	7		1	1		
Mount Laurel	3		1	7	6		17	1,739		1	1						2	2		1	1	1	2	1	1	2	1	1
New Hanover	6	2	3	4	8		23	2,373										6	3	1	1	1	2		2			
Northampton	16	5	4	23	30		78	4,630			1						6	16	3	8	8	4	8	1	5	1	1	4
Pemberton	14	6	2	18	22		62	2,885		1	3		1			2	10	7	3	4	7	1	5		7			1
Randolph	3	1		1			5	428					1				2		2									
Shamong	2		1	4	4		11	1,097									1	4	1		1		1		1			
Southampton	5	5	2	7	5		24	2,270								1	1	5	7	3	2	1			1			
Springfield	3	1	4	4	1		13	1,886			2					2	1	1		1	1				2			
Washington	1	1	1	1	3		7	389									1	3	1						1			
Westhampton	6	1		4	3		14	715			1					1	1	2			1		1	1		1		
Willingboro	2	1	2	3	2		10	743								1	3	1			1		1	1	1			1
Woodland			1	1	1		3	325										2										
Death rate per 1000 of county									14.42																			
Death rate per 1000 of county, exclusive of cities of over 5000.									13 91																			
	165	93	77	224	230	10	799			8	16		4		5	53	68	150	60	47	60	30	[illegible]	10	52	15	5	14

†Exclusive of city.

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of CAMDEN. Population..........62,941. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH.																		
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.			Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Camden	226	131	85	246	106	9	803	41,658	19.27	6	25	10	9	1	7	37	120	115	71	66	37	17	51	......	25	24	1	6
Centre	14	5	5	8	8	1	41	1,538	....	1	4	......	......	......	......	......	7	2	8	3	......	2	2	......	4	......	......	2
Delaware	2	2	1	5	3	......	13	1,481	....	......	......	......	......	......	......	......	1	2	3	1	2	......	......	......	......	1	......	......
Gloucester Township	12	1	5	24	30	......	72	2,527	....	......	4	......	......	......	......	......	8	9	5	......	9	2	8	2	4	1	......	......
Gloucester City	28	14	6	22	14	......	84	5,347	15.70	......	1	......	......	......	1	6	18	17	5	6	3	......	5	......	3	1	......	1
Haddon	12	4	4	13	14	......	47	2,551	....	1	......	......	1	......	1	1	3	10	6	3	2	1	3	......	7	1	......	1
Merchantville Borough	....	....	....	....	....	......	....	†3,093	....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Stockton	24	7	4	16	11	......	62	439	....	3	1	......	......	......	......	......	21	9	2	2	5	1	3	......	5	2	......	......
Waterford	8	2	2	6	7	......	25	2,077	....	......	......	......	1	......	......	1	1	3	3	3	2	......	3	......	1	......	......	1
Winslow	12	2	3	7	13	......	37	2,230	....	......	......	......	2	......	......	......	6	1	5	3	1	1	5	......	4	......	......	......
Death rate per 1000 of county	....	....	....	....	....	......	....	....	18.81	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1000 of county, exclusive of cities over 5000	....	....	....	....	....	......	....	....	18.63	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	338	168	115	347	206	10	1,184	....	....	11	35	10	13	1	9	45	185	168	108	87	61	24	80	2	53	30	1	11

†To be included in Stockton township.

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of CAPE MAY. Population..........9,765. Statistical Divisions.	DEATHS AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																		
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung disease.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Cape May City	6	5	5	5	3		24	1,699		1	1		4			1	3		1	3		1	2	1	2	2		
Dennis	4	1		3	3		11	1,812			1				1		3	1	1						1	2		
Lower	13	6	3	3	2		27	1,977			1		3		2		6	4		5			1			1		
Middle	8	5	7	2	13	2	37	2,575					1			6	6	4	4	2	1	1	4		5	1		
Upper	6	2	2	9	8		27	1,702			1						3	3	2	3		1	4		2	1	1	
Cape May Point								†198																				
Death rate per 1000 for county									12.90																			
	37	19	17	22	29	2	126			1	4		8		3	7	21	12	8	13	1	3	11	1	10	7	1	

†Included in population of Lower township.

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of CUMBERLAND. Population.........37,604. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Bridgeton	48	15	11	43	38	......	155	8,720	17.75	......	2	......	4	......	3	9	21	28	14	9	6	4	10	2	6	3	1	4
Commercial	11	1	6	6	7	......	31	2,265	......	......	......	......	......	......	......	4	1	6	4	2	......	......	4	......	2	......	......	......
Deerfield	5	1	......	2	7	1	16	1,643	......	......	......	......	......	......	......	......	2	2	4	1	......	......	2	......	1	......	......	......
Downs	5	......	......	6	7	......	18	1,687	......	......	......	......	......	......	......	......	......	2	5	1	2	......	......	......	2	......	1	......
Fairfield	7	3	1	10	12	1	34	3,215	......	1	4	......	......	......	......	......	4	2	......	3	3	......	5	......	4	1	......	......
Greenwich	1	4	1	6	7	......	19	1,245	......	......	2	......	......	......	2	......	1	3	3	......	......	......	1	......	2	......	......	1
Hopewell	4	......	......	6	13	......	23	1,764	......	......	......	......	......	......	......	......	2	7	2	......	4	1	4	......	1	......	......	......
Landis	18	8	6	29	32	......	93	6,005	......	......	2	......	1	......	......	......	4	14	12	9	6	1	9	......	5	10	......	2
Maurice River	8	2	2	11	13	......	36	2,374	......	......	1	......	......	......	......	1	1	8	4	2	3	......	3	......	5	2	......	......
Millville	39	55	15	38	24	3	174	7,660	22.71	......	2	......	13	......	......	21	28	36	22	10	3	3	6	......	8	1	1	......
Stoe Creek	2	1	1	3	5	......	12	1,107	......	1	......	......	......	......	......	1	1	......	1	......	1	......	1	......	2	......	......	1
Death rate per 1000 of county	......	......	......	......	......	......	......	......	16.20	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1000 of county, exclusive of cities of over 5000	......	......	......	......	......	......	......	......	13.23	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	148	90	43	160	165	5	611	......	......	2	13	......	18	......	5	36	63	108	71	37	28	9	45	2	38	17	3	8

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of ESSEX. Population.....189,819. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Belleville	9	10	6	9	11	......	45	3,004	....	5	......	......	......	......	1	7	2	4	7	3	2	2	1	1	2	1	......	......
Bloomfield	17	10	3	21	29	1	81	5,748	....	2	......	......	2	1	1	......	10	6	16	6	6	3	9	2	1	2	......	1
Caldwell	6	1	1	11	17	......	36	3,167	....	2	1	......	......	......	......	2	3	5	5	2	4	1	4	......	1	1	......	1
Clinton	9	2	4	9	14	......	38	2,742	....	1	......	......	......	......	......	4	2	6	4	3	3	2	5	1	1	1	......	......
East Orange	22	10	13	26	30	......	101	8,349	12.09	2	7	......	1	1	......	3	11	15	11	4	8	4	4	2	4	......	......	4
Franklin	3	3	1	3	6	......	21	1,617	....	1	......	......	......	......	......	1	1	3	4	3	......	1	4	1	1	1	......	......
Livingston	4	2	....	3	4	......	13	1,401	....	......	......	......	......	......	......	......	3	3	1	2	1	1	2	......	1	......	......	......
Millburn	2	2	1	7	8	......	20	1,743	....	1	......	......	2	......	......	......	1	1	2	2	......	......	7	......	......	......	1	......
Montclair	18	5	4	30	24	......	81	5,146	....	1	5	......	......	......	......	5	7	10	8	5	4	4	9	......	3	3	......	3
Newark	641	373	222	899	414	4	2,553	136,400	18.71	48	72	......	35	3	11	144	208	396	308	251	121	82	178	5	115	62	5	27
Orange	55	30	22	77	32	......	216	13,206	16.35	2	3	......	2	1	1	3	39	47	37	16	6	4	13	2	10	4	......	1
South Orange	9	8	3	15	14	......	49	3,911	....	2	2	......	1	1	......	2	4	6	5	2	4	3	2	1	1	1	......	1
West Orange	5	5	6	15	10	......	41	3,385	....	......	1	......	......	......	1	1	3	9	5	4	4	3	1	1	3	......	1	1
Death rate per 1000 for county	....	....	....	....	....	......	....	....	17.35	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1000 for county, exclusive of cities of over 5000.	....	....	....	....	....	......	....	....	13.33	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	800	461	286	1,130	613	5	3,295	....	....	67	190	......	43	7	15	172	384	511	413	303	163	110	239	16	143	76	7	39

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of GLOUCESTER.

Population .... 25,886.

DEATHS AT ALL AGES.

Statistical Divisions.	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.
Clayton	8	8	2	7	9		34	1,981	
Deptford	3	2	1	8	8		22	1,520	
Franklin	11	8	2	5	8		34	2,480	
Glassboro	17	8	4	4	2		30	2,088	
Greenwich	7	6	5	15	17	2	52	2,598	
Harrison	3	1		11	12		27	2,841	
Logan	5	3	2	2	7		19	1,765	
Mantua	7	3	2	5	5	1	23	1,718	
Monroe	9	6	8	11	6		35	1,858	
Washington	7	1	2	6	2		18	1,366	
West Deptford	3	3	5	8	6	1	26	1,399	
Woodbury	9	1	3	9	5		27	2,298	
Woolwich	2	2	1	12	11		28	1,974	
Death rate per 1000 for county									14.48
	91	47	32	103	98	4	375		

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Clayton		1					5	3	7	5	1			2		3	1		
Deptford	2							1	1	5	1		1	1		3			
Franklin				2			5	4	3	3	1	3	1	3		1			
Glassboro		1		3			4	6	3	4	3	2			1	1			
Greenwich	1	2		1		1	1	5	5	3	3	6	1	7			1	1	
Harrison		3				1			2	8		3		3		6	1		
Logan				1			1		3	3			1			1	2	1	
Mantua		2			1		1	1				2	2	3		4			
Monroe		2					2	7	7	5	4	2		1		3			
Washington								4	3	2		1		1		4			
West Deptford	3							2		1	3	2		4		2	1	1	2
Woodbury		1					1	2	3	4	2		1	2		1	1		
Woolwich		1					1		8	1	1	4	2	1		4			
Death rate per 1000 for county																			
	6	13		7	1	2	21	35	45	39	19	25	9	28	1	33	7	3	2

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of HUDSON. Population.........187,950. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Bayonne	37	33	2	53	16	......	141	9,372	15.04	1	......	......	3	......	2	10	19	22	14	16	5	1	5	1	6	3	......	2
Guttenberg	9	4	1	10	3	......	27	1,206	....	1	1	......	......	......	......	......	7	1	8	2	2	1	2	......	......	1	......	......
Harrison	30	17	14	53	13	2	129	5,510	23.41	7	2	......	1	1	......	......	11	20	19	12	6	5	6	......	5	2	......	2
Hoboken	208	150	64	244	68	......	734	30,999	23.71	5	8	......	23	5	6	49	107	76	93	102	37	27	28	7	29	12	3	13
Jersey City	644	525	267	798	295	4	2,533	120,728	20.98	57	31	......	148	23	16	164	292	344	260	265	114	61	109	12	101	35	8	31
Kearney	2	3	4	10	5	......	24	2,165	....	1	......	......	......	......	......	......	1	2	6	3	1	......	......	......	2	3	......	......
North Bergen	26	13	17	62	45	1	164	4,268	....	6	3	......	8	2	......	......	19	29	16	8	5	9	17	2	9	5	......	1
Town of Union	36	41	17	23	14	......	121	5,849	20.68	4	2	......	17	3	......	5	14	12	9	14	4	3	7	......	4	3	......	1
Union	8	4	7	7	3	......	29	1,310	....	......	1	......	5	......	......	3	4	4	5	1	......	3	1	......	......	......	......	......
Weehawken	7	8	6	12	2	......	35	1,102	....	3	......	......	3	......	1	2	3	......	6	8	1	......	1	......	......	......	......	3
West Hoboken	27	14	8	25	14	......	88	5,441	16.17	1	2	......	3	......	......	4	9	7	8	16	8	1	1	......	6	3	1	1
Death rate per 1000 of county	....	....	....	....	....	......	....	....	21.41	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1000 of county, exclusive of cities	....	....	....	....	....	......	....	....	23.68	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	1,034	812	407	1,287	478	7	4,025	....	....	86	50	......	211	34	25	237	486	516	448	532	183	114	177	22	162	67	12	54

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of HUNTERDON. Population .... 38,563. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census, of 1880.	Death rate per 1000.
Alexandria	3		1	4	9		17	1,324	
Bethlehem	4	6	8	15	12		45	2,830	
Clinton Township	8	1		2	5		11	2,133	
Clinton Borough	2			4	5	1	12	842	
Delaware	3	3	2	10	12	1	31	3,092	
East Amwell	7	1	2	3	10	1	24	1,696	
Franklin	3	1	2	5	6		17	1,338	
Frenchtown	1	1		3	5		10	1,039	
High Bridge	4	2		10	5		21	2,209	
Holland	3	9	5	5	6		28	1,886	
Kingwood	2	2		3	8		15	1,694	
Lambertville	13	12	18	17	18		78	4,183	
Lebanon	8	3	2	13	8	2	36	2,699	
Raritan	6	1	4	17	15		43	4,186	
Readington	5	3	1	13	18		40	3,103	
Tewksbury	5	1	3	3	7		19	2,108	
Union		1		4	5		10	1,167	
West Amwell	3	5	3	3	4		18	1,039	
Death rate per 1000 for county									12.31
	75	52	51	134	158	5	475		

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Alexandria		2		1				1	1	3		3		4		1			
Bethlehem		3		1			2	7	8	3		3	2	5	1	5	1		
Clinton Township							1	1	1	1	2	2				1			
Clinton Borough								2	4			1				1	1		
Delaware	1	2						2	1	2		1		4		3	1	1	1
East Amwell							3		2		1	2	2	3		1			
Franklin								2	3	2	1	1		4		1			
Frenchtown									3		1			4					
High Bridge						1	1		4	2	1	3	1	1			2	1	1
Holland				5		1	6	1	2	1	1	4		2		1		1	
Kingwood								2	1	4		4		1			1		
Lambertville		2					19	6	11	5	3	3		6		2	2		
Lebanon	1	3						9	5	5		4		3		2	1		
Raritan		1				1		4	8			6	3	6	1	2	1		
Readington						1		1	3	4		4		5		6	3		1
Tewksbury									5	4	1	1		3		1			
Union		1		1					4	1		1		1					
West Amwell							4	1	1	6				2		1			
Death rate per 1000 for county																			
	2	14		8		4	36	39	67	43	11	43	8	54	2	28	13	3	3

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of MERCER. Population.....58,058. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Chambersburg	25	14	19	38	9	4	109	5,437	20.04	.....	5	.....	14	1	2	2	9	17	12	7	3	.....	6	1	7	2	.....	1
East Windsor	8	6	1	4	16	.....	35	2,271	.....	.....	.....	.....	.....	.....	1	1	3	5	5	1	1	.....	1	2	4	.....	1	1
Ewing	.....	1	.....	20	9	.....	30	2,412	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	2	.....	3	.....	†16	.....	3	.....	.....	.....
Hamilton	7	3	7	22	14	1	54	3,370	.....	.....	1	.....	.....	.....	.....	.....	7	13	5	3	4	2	3	.....	5	1	.....	2
Hopewell	6	3	3	13	15	1	41	4,462	.....	.....	.....	.....	.....	.....	1	.....	2	6	.....	1	2	1	9	.....	3	3	.....	1
Lawrence	11	6	2	12	14	2	47	3,171	.....	.....	1	.....	6	.....	.....	.....	4	7	6	6	3	1	2	.....	4	.....	.....	.....
Princeton	20	9	10	16	26	.....	81	4,348	.....	.....	7	.....	2	1	.....	2	10	8	11	5	6	.....	6	.....	6	1	.....	1
Trenton	138	75	75	196	118	16	618	29,910	20.66	5	5	.....	66	1	2	6	54	108	43	40	31	16	38	3	33	11	2	7
Washington	2	1	2	5	8	.....	18	1,281	.....	.....	.....	.....	.....	.....	1	1	.....	3	1	.....	.....	1	3	.....	5	2	.....	.....
West Windsor	2	2	.....	5	6	.....	15	1,396	.....	.....	.....	.....	.....	.....	.....	1	2	3	.....	.....	.....	2	3	.....	2	.....	.....	.....
Death rate per 1000 of county	.....	.....	.....	.....	.....	.....	.....	.....	18.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Death rate per 1000 of county, exclusive of cities over 5000	.....	.....	.....	.....	.....	.....	.....	.....	14.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	219	120	119	331	235	24	1,048	.....	.....	5	19	....	88	3	7	13	91	174	85	63	53	23	87	6	72	20	3	13

†Excess of adult brain deaths in Ewing belongs to asylum.

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of MIDDLESEX. Population.....52,286. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhœal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Cranbury	4	3	2	11	8	......	28	1,599	....	......	......	......	1	......	......	......	......	7	7	......	2	1	2	......	2	......	......	......
East Brunswick	9	7	5	15	12	......	48	3,272	....	2	......	......	1	......	......	3	2	7	3	2	......	1	3	......	4	2	......	1
Madison	4	2	2	6	8	......	22	1,662	....	......	......	......	......	......	......	......	2	1	3	2	2	1	2	......	2	......	1	......
Monroe	6	5	4	15	13	1	44	3,016	....	1	2	......	1	......	1	3	1	11	4	......	3	1	1	......	3	2	......	......
New Brunswick	93	32	24	65	55	......	269	17,167	15.66	2	6	......	1	6	......	8	45	36	27	24	14	9	17	4	13	11	......	1
North Brunswick	5	1	2	6	6	......	20	1,251	....	......	1	......	......	......	......	......	1	4	2	2	2	......	4	......	......	......	......	......
Perth Amboy	29	8	5	22	18	1	83	4,808	....	1	1	......	1	......	......	2	14	6	12	7	4	1	6	......	6	1	......	......
Piscataway	5	5	3	17	15	1	46	3,242	....	1	1	......	......	......	1	......	3	9	2	2	1	3	2	......	3	......	......	......
Raritan	11	1	4	12	18	......	46	3,789	....	1	......	......	......	......	......	1	1	7	4	1	3	1	4	1	2	......	......	......
Sayreville	5	3	7	7	4	......	26	1,930	....	2	......	......	......	......	......	7	1	......	1	1	......	1	......	......	......	1	......	2
South Amboy	9	13	6	17	6	1	52	3,648	....	3	......	......	......	......	......	9	6	5	6	1	3	5	2	......	1	1	......	......
South Brunswick	8	9	4	12	16	......	49	2,803	....	1	......	......	3	......	......	3	6	6	4	3	......	1	6	1	2	2	......	1
Woodbridge	13	4	7	8	12	......	44	4,099	....	2	......	......	......	......	......	......	5	3	8	2	3	......	5	......	......	2	......	......
Death rate per 1000 of county	....	....	....	....	....	......	....	....	14.86	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1000 of county, exclusive of cities of over 5000.	....	....	....	....	....	......	....	....	14.46	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	201	93	75	213	191	4	777	....	....	16	11	......	8	6	2	36	87	102	83	47	37	25	54	6	38	23	1	5

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of MONMOUTH. Population... 53,535 Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH.																		
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.			Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Atlantic	3	......	......	1	2	......	6	1,743	......	......	1	......	......	......	......	......	......	......	......	2	1	......	......	......	1	......	......	......
Eatontown	10	3	3	10	15	......	41	2,637	......	......	......	......	......	......	......	1	5	10	3	1	2	2	4	......	5	......	......	......
Freehold	7	9	5	17	22	7	67	4,302	......	......	......	......	1	......	1	1	5	11	3	5	8	3	8	......	11	......	1	3
Holmdell	2	1	2	3	5	......	13	1,575	......	......	......	......	......	......	......	......	1	2	......	2	1	......	3	......	1	1	......	......
Howell	14	4	2	14	9	1	44	3,374	......	......	1	......	......	......	......	1	7	6	6	3	1	2	2	......	3	1	......	3
Manalapan	7	4	1	9	13	......	34	2,117	......	......	1	......	......	......	......	......	2	8	2	......	6	1	2	......	2	......	......	......
Marlboro	11	......	1	6	9	......	27	2,183	......	......	......	......	1	......	......	......	4	5	1	3	2	1	3	......	1	......	......	......
Matawan	13	8	2	10	14	1	48	2,699	......	......	1	......	......	......	......	1	6	10	4	5	4	1	......	......	1	1	......	1
Middletown	17	1	10	13	21	......	62	5,059	......	......	......	......	......	......	......	5	11	11	3	......	3	1	3	......	7	2	......	1
Millstone	10	3	2	8	11	......	34	2,080	......	......	......	......	......	......	1	1	8	3	3	4	2	......	2	......	4	1	......	1
Neptune	18	19	4	15	5	2	63	4,187	......	......	......	......	2	......	......	5	22	7	2	5	3	1	1	1	4	2	......	......
Ocean	24	6	7	28	17	1	83	6,027	......	......	1	......	......	......	1	......	7	13	4	7	4	7	8	1	1	......	......	......
Raritan	19	9	3	16	13	1	61	3,891	......	......	2	......	1	......	1	2	12	11	2	6	2	4	2	......	2	1	1	2
Shrewsbury	20	10	5	14	24	......	73	6,526	......	......	......	......	1	......	1	1	9	8	5	6	5	1	9	......	5	4	......	3
Upper Freehold	3	3	4	20	17	2	49	3,236	......	1	1	......	......	......	......	......	......	16	3	3	1	......	7	......	4	2	......	......
Wall	17	7	5	9	9	......	47	3,829	......	......	......	......	......	......	......	4	3	7	3	5	2	......	5	......	4	......	......	1
Death rate per 1000 of county	......	......	......	......	......	......	......	......	13.54	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	195	87	56	193	206	15	752	......	......	1	8	......	6	......	5	23	102	128	44	57	42	24	58	2	56	15	2	15

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of MORRIS. Population..........50,867. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.
Boonton	5	6	4	13	14	1	43	2,685	
Chatham	19	8	5	19	23		74	4,277	
Chester	3	2	1	13	4		23	2,337	
Hanover	10	2	1	5	21	2	41	4,138	
Jefferson	4	1	6	9	5	2	27	1,792	
Mendham	1	3		5	12		21	1,526	
Montville	3			3	4		10	1,270	
Morristown	22	11	6	52	36	1	128	6,838	18.71
Mount Olive	6	3		11	5	1	26	1,982	
Passaic	5	1	1	2	7		16	1,896	
Pequannock	5	6	3	6	6	1	27	2,239	
Randolph	28	22	8	34	16		108	7,701	
Rockaway	22	16	9	23	19	1	90	7,366	
Roxbury	6	5	6	11	5		33	2,139	
Washington	4		2	4	8		18	2,681	
Death rate per 1000 of county									13.26
Death rate per 1000 of county exclusive of cities over 5000									12.05
	143	86	52	210	185	9	685		

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Boonton	1			1				4	6	6	2	2	3	3		2	1		
Chatham	1	3				5	1	2	12	8	6	8	2	7	1	5	2		1
Chester	1	1							5	2	2	1		2	1	1	1	2	2
Hanover	2				1			4	4	6	2	2	3	5		2	3		
Jefferson								2	6	5		2		3	1	2	1		2
Mendham						1			1	2	2	4	1	1		4			1
Montville	2							1	1		1			2					
Morristown	2						4	17	19	9	6	6	5	†34		5	3	1	
Mount Olive	3	1						4	4	1	1	2	1	4			1		
Passaic							2	4	2	1	1			2		3			
Pequannock	2	2		1			4		2	1	1	1	2	2		2			1
Randolph	2	2		4	6	1	5	9	12	14	9	7	2	4		8	5		2
Rockaway	4			3	3		1	10	8	25	6	2	1	4	1	5	2		4
Roxbury		1					1	2	3	7	3	3	1	2		1	1	1	
Washington				1				1	2	4	1	2		5					1
Death rate per 1000 of county																			
Death rate per 1000 of county exclusive of cities over 5000																			
	20	10		10	10	7	18	60	87	91	43	42	21	80	4	40	20	4	14

† Eight at asylum of adult brain disease.

Return of Deaths from all Causes and certain specified Diseases, in the Statistical Divisions of the State of New Jersey, for the year ending June 30th, 1880.

County of OCEAN. Population 14,455. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Berkley	4	1		3	4		12	683									1	1	1				1		2			
Brick	6	5	4	14	13		42	2,990			1					2	1	10	5	2	1	1	6	2	4		1	1
Dover	1	3	5	8	7		24	2,439		1	1					1	2	5		1			3		1	1		
Englewood	1			3	3		7	592									1	2			1				1	1		
Jackson	7	1	1	5	5		19	1,803			1					2	1	2	1		1		3		2			1
Lacey	2			1	3	1	7	814							1			1			1				1	1		
Manchester	4	1	1	2	3		11	1,057									2		2	1					3	1		
Ocean	1			2			3	484			1						1								1			
Plumsted	1	2	1	8	4		16	1,561					1		1			4		1	1		2		2	1		
Stafford	2	1		1	4		8	1,008							2			1	1		1		1					
Union	4	2	2	3	2		13	1,024								1	3	2	1	1			1		1		1	
Death rate per 1000 of county									11.20																			
	33	16	14	50	48	1	162			1	4		1		4	6	12	28	11	6	6	1	17	2	18	5	2	2

County of PASSAIC. Population.........68,716. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Acquacknock	1	1	3	7	6	......	28	1,781	....	1	......	......	......	......	......	......	1	2	1	2	1	2	3	......	......	1	......	......
Little Falls	6	1	2	14	8	......	31	1,404	....	2	......	......	......	......	......	1	3	3	2	1	2	1	1	1	2	......	......	1
Manchester	2	1	4	5	1	......	13	1,513	....	......	......	......	......	......	......	1	1	1	2	2	......	1	2	......	1	......	......	1
Passaic City	43	26	13	44	14	2	142	6,532	21.73	1	2	......	1	......	......	10	22	14	13	22	8	3	3	3	8	1	......	4
Paterson	305	247	152	296	170	4	1,174	50,887	23.07	7	20	......	82	22	11	56	202	152	119	101	48	24	62	3	37	22	2	12
Pompton	7	3	2	4	5	......	21	2,251	....	......	......	......	2	......	......	......	2	4	2	1	2	......	......	1	2	2	......	......
Wayne	4	3	4	6	5	......	22	1,757	....	1	......	......	......	......	......	2	1	2	4	3	1	......	1	......	3	......	......	......
West Milford	9	6	2	9	11	......	37	2,591	....	......	......	......	......	......	......	......	6	2	3	5	2	1	......	3	3	2	1	1
Death rate per 1000 of county	....	....	....	....	....	......	....	....	21.36	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1000 of county exclusive of cities over 5000	....	....	....	....	....	......	....	....	13.44	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	377	288	182	395	220	6	1,468	....	....	12	22	......	85	22	11	70	238	180	146	137	64	32	72	11	56	28	3	19

County of SALEM. Population..........24,580. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Elsinboro	4	2	......	......	5	.....	11	570	......	.....	.....	.....	.....	.....	.....	.....	4	.....	2	.....	.....	1	1	.....	.....	1	.....	.....
Lower Alloways Creek	2	2	2	4	7	.....	17	1,378	......	.....	1	.....	.....	.....	.....	3	1	.....	.....	1	1	1	2	.....	2	3	.....	.....
Lower Penn's Neck	5	3	3	9	9	.....	29	1,334	......	.....	2	3	.....	.....	.....	.....	2	5	7	.....	.....	1	1	.....	2	.....	.....	.....
Mannington	11	5	5	12	14	2	49	2,230	......	1	1	.....	.....	.....	.....	.....	5	2	9	3	2	2	6	.....	5	.....	.....	1
Pilesgrove	7	5	2	16	18	.....	48	3,497	......	.....	.....	.....	.....	.....	.....	.....	3	8	6	3	2	.....	9	4	4	.....	2	.....
Pittsgrove	4	1	1	3	7	.....	16	1,778	......	.....	.....	.....	.....	.....	.....	1	1	5	.....	.....	.....	.....	3	.....	.....	1	.....	.....
Quinton	4	1	1	10	4	.....	20	1,300	......	.....	.....	.....	.....	.....	.....	.....	.....	4	2	.....	1	.....	4	.....	1	1	.....	2
Salem	23	8	10	18	16	1	76	5,057	15.02	.....	1	.....	.....	.....	2	8	10	8	8	1	.....	.....	8	.....	6	.....	.....	3
Upper Alloways Creek	2	2	6	3	10	.....	23	1,017	......	.....	.....	.....	1	.....	.....	2	.....	3	6	3	1	.....	1	1	2	.....	.....	.....
Upper Penn's Neck	11	1	8	16	13	3	52	3,361	......	1	1	.....	.....	.....	.....	1	2	8	5	2	4	2	2	2	2	4	.....	.....
Upper Pittsgrove	3	3	1	7	7	.....	21	2,073	......	.....	1	.....	1	.....	.....	.....	1	6	1	2	.....	1	1	.....	.....	2	.....	.....
Death rate per 1000 of county	......	......	......	......	......	.....	......	......	14.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Death rate per 1000 of county, exclusive of cities over 5000	......	......	......	......	......	.....	......	......	14.64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	76	33	39	98	110	6	302	......	......	2	7	3	2	.....	2	15	29	49	46	16	11	8	38	7	24	12	2	6

County of SOMERSET. Population.........27,161. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Bedminster	4	1	1	7	9	......	22	1,812	....	......	......	......	......	......	......	......	2	4	......	1	1	......	5	1	3	......	......	......
Bernards	8	3	1	15	8	......	35	2,622	....	......	1	......	1	......	......	......	4	8	7	......	2	......	1	......	5	......	......	1
Branchburg	2	1	1	6	9	......	19	1,316	....	......	......	......	......	......	......	......	......	......	......	2	2	2	3	......	3	......	......	1
Bridgewater	23	10	10	30	30	1	104	7,997	....	2	1	......	......	......	1	4	10	19	8	9	6	5	7	2	8	1	2	......
Franklin	11	9	3	13	18	1	55	3 818	....	2	......	......	......	......	......	......	4	2	9	7	......	5	4	......	6	1	......	2
Hillsborough	7	2	1	9	25	......	44	3,248	....	......	......	......	......	......	......	......	1	4	6	......	3	2	6	......	2	5	2	......
Montgomery	5	1	2	4	6	......	18	1,928	....	1	......	......	......	......	......	......	2	2	2	......	2	......	3	......	......	......	......	......
North Plainfield	7	3	2	13	11	......	36	3,217	....	......	......	......	1	......	......	......	2	3	6	2	2	1	5	2	......	4	1	......
Warren	4	1	1	2	2	......	10	1,203	....	......	......	......	......	......	......	......	3	2	1	......	3	......	......	......	1	......	......	......
Death rate per 1000 of county	......	......	......	......	......	......	......	....	12.62	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
	71	31	22	99	118	2	343	....	....	5	2	......	2	......	1	4	28	44	39	21	21	15	34	5	28	11	5	4

County of SUSSEX.

Population 23,553.

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.
Andover	1		1	4	2		8	1,150	
Byram	3	5	2	3	4		17	1,406	
Frankford	2	1	3	11	8		25	1,680	
Greene		1		2	5		8	727	
Hardyston	7	1	2	14	13	2	39	2,645	
Hampton	2	1		1	5		9	895	
Lafayette	2			2	4		8	780	
Montague	3	3	2	1	6	1	16	1,022	
Newton	6	2	3	11	8		30	2,513	
Sandystone	2	4	4	4	2		16	1,195	
Sparta	3	4	4	7	10		28	2,274	
Stillwater	3	2	2	6	6		19	1,502	
Vernon		2	4	3	5		14	1,828	
Walpack	1		2	1	1		5	575	
Wantage	4	4	10	11	13		42	3,361	
Death rate per 1000 of county									12.05
	39	30	39	81	92	3	284		

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent feves, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	cute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Andover		1					1		3	2				1					
Byram	2	1		3				1	2	2	2		1						
Frankford		1							2	2		3	1	1		2	1		
Greene									2	1		1		2		1			
Hardyston	2	1						2	9	7	2	2		3		5	2		1
Hampton							1	1		1		1		2	1	1			1
Lafayette									1	1		2		2			1		
Montague				4				1	2	1				1			2	1	
Newton		3					2	2	6	2			1	4		1	1		1
Sandystone				5				1	1	1	3	1		2			1		
Sparta	1							1	4	4	4	1	1	6			1	1	
Stillwater		1							2	5		2		3					
Vernon				2			3			1	2	1		1		2			1
Walpack								1						2					
Wantage	2	4		1			1	1	4	7	8	1	1	5			1		1
Death rate per 1000 of county																			
	7	12		15			8	11	38	37	21	15	5	35	1	12	8	2	5

County of UNION. Population ....55,571. Statistical Divisions.	DEATHS AT ALL AGES.								
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.
Clark	2						2	353	
Crawford			1	8	2		11	1,184	
Elizabeth	110	74	36	131	86	3	440	28,229	15.58
Fanwood	3		1	5	7		16	1,167	
Linden	7	4	2	7	8		28	1,889	
New Providence	4				7		11	781	
Plainfield	24	9	10	36	18	1	98	8,126	12.06
Rahway	32	8	5	34	37		116	6,454	17.97
Springfield		4		10	9		23	844	
Snmmit	5	4	2	8	7	1	27	1,910	
Union	8	3	2	7	8		28	2,418	
Westfield	9	3	2	15	11		40	2,216	
Death rate per 1000 of county									15.11
Death rate per 1000 of county, exclusive of cities of over 5000.									14.57
	204	109	61	261	200	5	840		

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH.																		
	Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Clark								1											
Crawford	3									1	1	1		2		1			1
Elizabeth	5	6		2	2	9	24	52	49	44	39	24	7	35		21	11	1	7
Fanwood									3	3	2	1	1						
Linden		2				1		3	3		1	3		1					2
New Providence								1		2			1	2			1		
Plainfield	2	4					2	13	19	9	7	5	3	9		5	1	1	1
Rahway	2					2	1	9	26	12	6	7		10	1	15	5		3
Springfield				1			2		2	6		2		6					
Snmmit	1								5	2		2	2	4	1				
Union	1						2	4	2	1	1	4				3	1		
Westfield	1	6	1				1	3	6	3	3	2	3	4			2		1
Death rate per 1000 of county																			
Death rate per 1000 of county, exclusive of cities of over 5000.																			
	15	18	1	3	2	12	32	86	115	83	60	51	17	73	2	45	21	2	15

County of WARREN. Population .... 36,588. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1000.
Allamuchy	1		2	2	1		6	648	
Belvidere	7	6	1	11	5	1	31	1,773	
Blairstown	2	1	1	4	3	1	12	1,458	
Franklin	4	4	2	4	6		20	1,529	
Frelinghuysen	2	2	1	3	5	1	14	1,042	
Greenwich	11	17	2	11	11		52	2,554	
Hackettstown	3	6	1	11	7	1	29	2,502	
Hardwick				2	5		7	583	
Harmony	2	1	1	3	4	1	12	1,350	
Hope	5	2	2	5	6		20	1,570	
Independence		2	1	7	2		12	1,018	
Knowlton	2	2	1	8	6		19	1,476	
Lopatcong	3	7	2	5	4	1	22	1,591	
Mansfield	9	3	1	7	8	1	29	1,709	
Oxford	21	16	7	19	14	1	78	4,593	
Pahaquarry	2		1	1			4	418	
Phillipsburg	39	25	21	21	20		126	7,180	17.54
Borough of Washington	4	3	3	11	6	1	28	2,142	
Washington Township	3			4	4		11	1,452	
Death rate per 1000 of county									14.54
Death rate per 1000 of county, exclusive of cities of over 5000.									13.80
	120	97	50	139	117	9	532		

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and Diphtheria.	Diarrhoeal diseases.	Consumption.	Acute Lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult Brain and Spinal diseases.	Erysipelas.	Digestive and Intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.
Allamuchy									3		1			1		1			
Belvidere		1				1	2	1	4	6	1	2	1	2		3		1	
Blairstown							1		1		1		1	3		1	2		
Franklin		2		1			1	2	1	1	3	2				2			
Frelinghuysen		1						2		1	3	1	1	1	1	1			
Greenwich	1			5		1		6	4	10	4	2		4		2	1		1
Hackettstown								1	4	3	9	3	1	2					1
Hardwick									1		2		1	1		2			
Harmony				1						3				1		2		1	
Hope				1					1	5	4	2	1	1					
Independence		2									1	4	1	1		2			1
Knowlton									1	1	2	2	1	1		3			
Lopatcong		1		5				1		5			1	3		1			
Mansfield		1					1	3	4	3	1	2	3	8		1			
Oxford	2	6		2			3	13	5	7	5	3	1	1		6	1		
Pahaquarry								1	1	1	1								
Phillipsburg		2		15		3	11	9	11	6	22	3	2	10		10	1		1
Borough of Washington	1						2	2	6	3		2	1	2	1		1		2
Washington Township									3	1	1	2		1					1
Death rate per 1000 of county																			
Death rate per 1000 of county, exclusive of cities of over 5000.																			
	4	16		30		5	21	41	50	56	61	30	16	38	2	37	6	2	7

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FIFTH ANNUAL REPORT

OF THE

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THE STATE BOARD OF HEALTH.

HON. HENRY C. KELSEY, Secretary of State,	Members ex-officio.
HON. JOHN P. STOCKTON, Attorney-General,	

	P. O. Address.
FRANKLIN GAUNTT, M. D.	Burlington.
THEODORE R. VARICK, M. D.	Jersey City.
EZRA M. HUNT, M. D.	Trenton.
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LABAN DENNIS, M. D.	Newark.
PROF. CYRUS F. BRACKETT	Princeton.

President	C. F. BRACKETT.
Secretary	E. M. HUNT.
Recording Clerk	E. A. OSBORN.

REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency, George C. Ludlow,

GOVERNOR:—As Secretary of the State Board of Health, I have the honor herewith to transmit to you its fifth annual report. Two reports previously made by commissions appointed by the Legislature, as well as the experience of localities, showed the need of attention to the health of the people as a great material interest. The four reports which then followed have elucidated not only the importance of the subject, but the commendable progress which is being made in many parts of the State in a wise concern for this important department of public welfare.

The developments both of science and of art have thrown light upon the records of actual experience, and show most forcibly that a large number of diseases are preventable, or can so far be limited as greatly to reduce their frequency and their virulence. Even those whose profession it is to deal with the sick are constantly being surprised at the amount of evidence accumulating to show that the causes of disease are within the possibilities of control. Much of this control can not be that of the individual. From some sources of ill-health he cannot protect himself because he can not be expected to have the knowledge of methods, such as by education, by free information, must be made the common property of every citizen. From others he can only protect himself by public provision, since the deadly nuisance may be on his neighbor's premises, or in the street, upon which he must travel.

Among those who have carefully looked into the matter, there is a prevailing sentiment that legislation needs to look more thoroughly after such interests of labor and of capital, and, hence, of all households and of all citizenship, in those respects in which health and life are imperiled by such preventable evils as necessarily fall within the range of public concern.

Edwin Chadwick, C. B., the veteran sanitarian of England, in a recent article, points out some of the interests and results of sanitary administration, which bear alike on public health, vital statistics and political economy. Commencing with a quotation from the Health Report of the Local Government Board for 1880, he says:

"'Before concluding the part of our report which relates to sanitary administration, it may be useful to draw attention to the annual death-rate for some years past, as indicating the effect which recent sanitary measures would appear to have had upon the public health.

"'The following table shows the death-rate for each of the four last decennial periods:

ENGLAND AND WALES.

Annual death-rate per 1000.	1841–50.	1851–60.	1861–70.	1871–80.
All causes............	22.4	22.2	22.5	21.5
Seven zymotic diseases................	......	4.11	4.14	3.36
Fever..................	......	0.91	0.88	0.49

"'From the above figures it will be seen that, speaking generally, the death-rate of the country remained stationary from 1840 to 1870, but that in the period 1871–80 it fell from 22.5 (of the previous decade) to 21.5, a reduction equivalent to nearly 4½ per cent. It may, therefore, be roughly estimated that about a quarter of a million of persons were saved from death in the ten years 1871–80, who would have died if the death-rate had been the same as in the previous thirty years. If twelve cases of serious but non-fatal illness be reckoned for every death, it follows that about 3,000,000 persons, or over one-ninth of the whole population, have been saved from a sick-bed by some influences at work in the past decade, which had not been in operation previously. The case, indeed, is still stronger than this. The death-rate of rural districts is habitually lower than that of urban districts; and as the population is steadily concentrating itself, more and more, into the towns, the death-rate of the whole country would tend to increase, if the other circumstances affecting it remained the same. When we find that this tendency has been so much more than merely counteracted, it becomes interesting to see where the gain has been, and to endeavor to trace some of the causes to which it may be due.

"'Comparing, then, 1861–70 with 1871–80, it will be seen from the foregoing figures that of the entire reduction of 1.0 in the death-rate, more than three-quarters (4.14—3.36=0.78) comes under the head of 'The Seven Zymotic Diseases;' of the diseases, that is, which are most influenced by sanitary improvements, and most amenable to control by the action of sanitary authorities. And of this three-quarters, just half (0.88—0.49=0.39), or three-eighths of the entire reduction, is in 'Fever'—the disease which, more than any other, shows itself in connection with such faults of drainage, of water-supply, and of filth accumulation, as it is within the province of good sanitary administration to remove.

"'It is particularly significant that, since the year 1870, when the fever death-rate was 0.80 per 1000, it has fallen pretty steadily, year by year, as follows, down to 0.32 in 1880:

1871	.70	1876	.44
1872	.61	1877	.41
1873	.58	1878	.42
1874	.59	1879	.30
1875	.55	1880	.32

"'Thus in the five years, 1871–5, the fever death-rate was 0.61; in the five years 1876–80, it was 0.38.'"

"During the decade from 1861 to 1870, there appeared to be no gain from the outlay on sanitary works or on sanitary service in England and Wales; but since then the service appears to have made an effective start, and the pecuniary gain may be thus stated: Under the inquiry as to interments, the cost of funerals—all round—was ascertained to be £5 each. The gain under that head will, therefore, be about one million by the quarter of a million of funerals saved during the last decade. The direct cost of sickness has been estimated at about £1 per case. The gain under that head during the decade will, therefore, amount to about three millions; a gain, that is to say, of medical treatment and other expenses. But the gain to the wage classes, from the saving of lost labor, will have been far greater. Dr. James Watts, who has had great experience in friendly societies, states the average loss of working time at two working weeks and a half per member between twenty-one and seventy years of age, and he estimates the total loss to the wage classes, by the loss of work through sickness, at upwards of thirteen millions per annum. The gain derivable from sanitation may be further illustrated from its advance in military service. The first British army went out to the Crimea under the established curative or medical service, and it was lost. Sanitary Commissioners, trained in service under the first General Board of Health, were then sent out to reform the condition of hospitals and camp, and within three months reduced the sickness and mortality from a plague-rate down to an ordinary standard of health, and by the end of the summer of 1855, to a rate lower than that of the best hospitals at home; and the War Minister declared in Parliament that by the application of their science the second army had been saved. Since then, the Army Medical Department has applied extended sanitary operations. Their exercise under great difficulties is best shown in India. Formerly the death-rate in the Indian army was 69 per 1000 per annum. The average mortality from 1869 to 1878 was only 20.41. There was, therefore, a gain of 48.59 per 1000; or, on the present force out there, a gain of 2350 men. The death-rate of the army at home was formerly 18 per 1000. In the year 1879 it was 7.55, being a gain of 10.55 per 1000. As the strength of the army in 1879 was 80,700, the gain was 843 per annum. The total gain to the army in India, and the army at home, and the rest of the army, will be 3443 men per annum. As each soldier is estimated at £100, this represents in money value £344,000, or more than a third of a million. It is not very easy to get at the real amount of the sickness, but the total gain, including the diminished death-rate, is considered to be under-rated at half a million per annum. For the decade, the total saving of military force from death have been upwards of forty thousand men, and upwards of eight millions and a quarter in money.

"The total number of men killed on the battle-field and on the deck, including those killed at Waterloo, Trafalgar, and the most severe battles during the twenty-two years' war was, according to the army returns, 19,796. The lives saved from premature destruction by the civil sanitary service, during each of the ten years of the decade, was 25,000. The wounded during the twenty-two years' war were 79,709; but, taking a serious sickness as equivalent to a wound, the achievement of the sani-

tary service has been, during the same period, some three millions of cases saved by the civil sanitary service. The deaths by steam explosions, in mines and on railways, amount to about 5000 annually, but the lives saved by the civil sanitary service in England and Wales are five-fold greater than the lives thus destroyed by civil accidental violence. A reduction of the death-rate by 4½ per cent. is only an instalment of sanitary progress. Thus, in the instance of Croydon, visited by the delegates of the Congress, the death-rate has been reduced from 25 to 16 per 1000, chiefly by the methods introduced by the first General Board of Health, by which spring supplies of pure water are carried into the houses, and the fouled water carried at once out of the houses and out of the town, by one Local Board Authority; while all putrescible matter, instead of remaining for months and years in conditions of putrefaction, is undecomposed, and flows upon the land within two hours. So in Salisbury, Leamington, and a number of other places. At Croydon, it has been stated by Dr. Alfred Carpenter that, by complete sanitation, the death-rate might be reduced to 10 in a thousand. In the Metropolis the death-rates among the wage classes in their common dwellings is upwards of 30 per 1000. In the model dwellings in London, it is, however, about 16 or 17, even with surrounding deteriorating conditions. On the demonstrations of various model instances, it may be held that the reduction of the general death-rate by 4½ per cent., as reported, satisfactory as this is, cannot be considered more than one-third of the results obtainable by advanced sanitary administration and further sanitary works. The pain and misery, and the social disorder, occasioned by excessive sickness and premature mortality, are generally beyond pecuniary estimation. Such estimates as those given serve to show the money loss incurred by inattention to the continuance of preventable physical evils."

Dr. De Chaumont, of the Royal Army College, at Netley, adds his testimony, thus:

"Parallel with the progress of medicine and the collateral sciences, advances have been made in sanitary science which amount to important revelations, so that it has become possible to lay down certain principles, which, as we have seen, are capable of practical application to the great advantage of us all. Thus, the dwelling in marshy districts has been proved by *incontrovertible* evidence to be usually followed by attacks of ague and fever of various kinds; that destitution and crowding give rise to typhus; that the withdrawal of vegetable diet produces scurvy; that small-pox, measles and scarlet fever are communicable by contact to otherwise healthy persons; and by *equally* strong evidence, though not so generally accepted, acknowledged and acted upon, sanitary science reveals to us that out of the 700,000 deaths which take place in one year in the United Kingdom, no less than one-third, or some 240,000 deaths, have been traced to those particular diseases which are liable to be favored or propagated by neglected house-sanitation. In fact, the highest medical and sanitary authorities have decided that by good sanitary appliances and surroundings, resulting in the maintenance of the purity of the air and water within and around our dwellings, typhoid fever, diphtheria, sore throat and cholera might be rendered exceptional diseases, instead of being, as they now are, the fruitful causes of illness and death to the alarming extent these statistics attest."

This care of the public health is no longer regarded as merely a professional concern, or one of generous patronage. The welfare of

the State and its highest material interests depend very much upon how far it promotes the health and life of the citizen. It is *political economy* that requires the closest attention to the subject. It has been said that the progress of a people can be tested by the exact attention given to the prevention of preventable diseases. It would seem as if the test were a safe one, for the greatest progress in statistical inquiry, and in the provision of State oversight, has been made by those who, in other respects, are admitted to be most prosperous.

The year has been an important one in the history of sanitary progress. The International Medical Congress, held in London, in August, 1881, devoted large attention to the consideration of sanitary questions. The English and European governments are showing their appreciation of the natural and economic import of the subject, and also of vital statistics, by large provisions of a State character. The sacrifice of human life, by avoidable diseases and accidents, is no longer disputed. Nor is it disputed that far more is known by way of prevention than is generally applied. It is accepted, too, as a principle of good government, that there must be in the interests of the people and for the material prosperity of the State, adequate provision made for governmental care of the public health. There are regards in which neither personal or local authority can avail. More authority and more outlay are needed in this State for the carrying out of provisions which are indisputably in the common interests of all the people.

In our own State, where the kinds of industry and the relations to great centres so guide population as to mass it in cities or group it in frequent villages, these demands are most imperative. Evidence is constantly reaching us as to admitted evils and the inadequacy of any local provisions to deal with them. It was not until the State provided and enforced local Boards of Health that it became possible to give either the requisite information or power. Until within two years, many of our cities had no Boards of Health, except in the form of occasional committees, and our townships were without that summary right to deal with positive nuisances, which is not unfrequently demanded. The authorization of local Boards of Health led to the establishment of over two hundred in the State, and to the reorganization of some in cities where, under charter law, they were ineffective. It will, of course, happen that some of these will be inadequate until they become more fully informed. But it is already gratifying to see how they are sources of information as well as of authority, and how

they help to prevent or abate existing evils. No one can compare the newspapers of the State, or read the correspondence coming to this Board, without being made aware of the spirit of inquiry and discussion which now has hold of the public mind as to these interests—a spirit which always means progress when the subject touches such vital interests. The Board has thus been enabled to become a bureau of information, as well as to perform the important service of unifying and comparing the records and the experiences of localities. It is often able to give direction to important sanitary measures in the various parts of the State, and is appealed to for advice and assistance in measures that involve the best personal and pecuniary interests of communities.

LOCAL EPIDEMICS.

In the report of last year we had occasion to notice the occurrence of four epidemics, so marked in their causes and results as to attract the attention of the public at large. Three of these had so far subsided as to enable us to give their history, but the fourth had not reached its height when the report was issued. A paper connected with this report will notice it more fully. The three other epidemics are of interest because of the results which have followed.

At the date of our report the alleged causes of the malaria at Bound Brook had been ordered to be removed—the dam which had obstructed the water courses had been taken down. Following upon this there was a thorough opening of the obstructed water courses, so as to secure a sufficient channel for the water, to give opportunity for the marsh, which had been overflowed, to dry.

The people of Bound Brook were aroused to the necessity of thorough sanitary work, and formed a local health organization, that devoted itself assiduously to completing the improvement, and to additional local care of any other possible sources of disease. The result is not only gratifying to the citizens of that town, but a new evidence of how far it is in the power of the people to abate or prevent disease.

On visiting the place about July 1st, of this year, we found the contrast in the appearance of the marsh such as could not but give promise of good results. We watched with interest the record of the summer months with their extreme heat and dryness. It is the testimony of the physicians and all the inhabitants that the evidence of malarial poison has so far vanished that the few cases occurring are

easily accounted for by the effects of the previous year. This is all the more marked because in the worst localities, in which no improvement took place, this year has also recorded a large number of cases. With the evidence that can be furnished from other States and countries as to the relationship of uninterrupted water courses, water-soaked lands and vegetable decay to periodic fevers, it ought not be necessary to adduce evidence near at hand. But, if needed, we here have it with the personal inspection and testimony of many competent witnesses, so pronounced as not to need the repetition of any other warning. Bound Brook now knows that a thirty thousand dollar tax ten years ago would not, even in a pecuniary way, have been so serious as the losses it has suffered. Its only comfort is that the renovation is so complete and the result so certified that it can regain its reputation for salubrity. In order to keep this it will need constant vigilance. Although, like other places, it may still have occasional cases, there is no reason to believe that such a prevalency will ever again occur.

The typhoid fever epidemic at Princeton was so plainly occasioned by local causes that the Trustees of the College, the Directors of the Theological Seminary, and the citizens of the town alike seem to have come to the conclusion that in some way or other the water supply and the sewerage of all Princeton must be put upon an unquestionable basis of health. The College at once proceeded to provide a system of local sewers and delivery, which is not yet completed.

The Seminary secured the services of Prof. McMillan, of the College, and at once applied the small pipe and flush tank system for the disposal of its sewage. We hope hereafter to present an outline of these. We call special attention to these improvements because they outline the methods which are applicable to most of the inland cities and smaller villages of the State. The citizens of the borough have taken more time for deliberation, but have come to feel that a system of water supply and sewerage is desirable for the entire community. Intelligent and thorough investigations have been made as to the sources for a supply of pure water. Sanitary maps and plans of sewerage have been furnished, and it is believed ere long a perfected system will be rapidly executed. It has been the pleasure of the Board to co-operate in many ways with these efforts, as it was early our duty to publicly and privately urge attention to those interests.

SMALL POX.

The delay in adequately dealing with the earliest cases of small pox in Camden, and the active and judicious measures afterward taken, show alike the evils of procrastination and the success which crowns vigorous efforts for the public health. The disease is one which is within our powers of control and could be made to cease from the earth, if vaccination were universally practiced. But it is our misfortune that we still need constantly to guard against the encroachments of this disease. Philadelphia, with all its excellent proclivities, has relied so much upon its good reputation for health, and has had such inadequate provision for accurate health inspection and protection that more than one city has been indebted to it for small pox, typhus and typhoid fevers. As to small pox, it seems to have come to be indigenous there. Its continued prevalence makes it all the more necessary that New Jersey should be protected. We are constantly having reports of sporadic cases in various parts of the State, and believe we owe it much to the local Boards and to the law permitting them to offer vaccination to the poor, that the disease has not gained the proportions of an epidemic throughout the State. It has more points of locality scattered over the State than in several years past. It is very important that the local Boards and city authorities insist that children attending school shall be vaccinated, and, as far as possible, that they extend the protection to those who are under school age.

Much has been said and written of late both as to the protective power of vaccination and as to the relative advantages of virus taken from children and that obtained directly from the cow. This latter is not, as some suppose, virus which has been taken from individuals and inserted into the teats of calves and so "freshened," nor is it a disease that often occurs spontaneously, and thus enables us to get it from original cases. It is so rare that most of our matter comes from an authenticated case of the spontaneous disease in France, and is known as the Beaugency stock. From the successive use of this upon calves we have a continuous line of virus in quantities. It is easy to see, however, that frauds may be perpetrated, and that the so-called animal virus, valuable as it is, may be variously substituted by that derived from persons. Or the operation, as conducted on calves, may be so carelessly done as that the liquid from the vesicle is mingled with blood or other foreign matters. This would not, in the vast majority of cases, be attended with any evil result. But, if the calf

happened to have any malignant disease, such an anthrax, it is not certain that there might not be peril. It is important to guard against any possibilities that might bring discredit upon this virus. Early in the year the Secretary, accompanied by Dr. F. Gauntt, visited the farm in this State where animal vaccination is performed, to furnish virus for the New York State Board of Health. Dr. F. Gauntt was also requested to make a thorough inquiry into the whole subject of animal vaccination, as it affects our own supply of virus. It is believed that this paper will direct more attention to the subject, and will lead our physicians and druggists to be more certain as to the source and quality of matter. Some of the Board and some of the States are considering the assured purity so important as to agitate the question whether the supply should not be under the direction or limitation of State Boards or local Boards.

DRAINAGE FOR HEALTH.

The relation of drainage to health has recently forced itself upon public attention, because of the admitted prevalence of malarial diseases in localities once free therefrom, and their great increase where they were more frequent. In contrast to this, has been the remarkable diminution of such diseases where thorough drainage systems have been perfected. If there is any one fact established both in Geology, Physical Geography and Hygiene, it is that the ponding or stagnation of water is hazardous to health. It is an almost inflexible rule that soil too wet to produce crops is too wet to live upon. Nature, indeed, by a growth of weeds, and by protection from the sun, sometimes intervenes to prevent serious consequences. But even this intervention is often interfered with by man. In the country, too, frequently, natural water courses are obstructed at points which involve large overflow or continuous stagnation. The necessary structural changes in cities will, unless guarded, cause many pits or receptacles of stagnant water, or prevent the natural insensible drainage, or that equally potent drainage which results from evaporation and from the free circulation of air in the ground. The time, therefore, has fully come when it is necessary for the State to consider just what the requisitions of drainage are, and thus keep the common interests of agriculture and health in their wonted relationship. In cities the subject will be still more urgent, because of the close assemblage of people and the various artificial hindrances which will arise.

It is true that stagnant water alone, if all organic matter could be removed or kept therefrom, would not probably cause malarial disease. It is also true that if vegetable matter could be kept constantly covered, the evil results would be postponed. It is quite as true that with our alternations of climate, our hot suns and our changes of dry and wet seasons, this result is not likely to be attained without special provision therefor. Heat and moisture are ever and anon sure to succeed in producing a fermentative process which results in excessive vegetable growth, or in chemical changes deleterious to health. The accumulation of such material, and the occurrence of favoring seasons with the suspension of culture and vegetable growth to appreciate the product, are sure to cause sickness and premature death. It is because of this not less than of its bearing on fertility of soil that England and France have found it profitable to expend so much on the drainage of the soil, both of city and country. No subject is now better understood. New Jersey has its Geology and its physical conformation plainly marked. Its stone and clays and limestone furnish ready at hand the materials for drains and sewers. Diseases have already marked out their indications and enforced the necessity by the records of pecuniary loss.

The drainage of the Great Meadows of Warren county has diminished malarial disease on a ratio proportionate to that with which it has increased the productiveness of the soil. Many of our cities are more in need of drainage than they are of sewers. The laws passed last winter bearing on the subject were most important and timely. Already some sections are availing themselves of the advantages they offer. There is not a State in the United States that has more important interests in this regard. We urge upon all townships, districts and municipalities, the great importance of the subject. The General Drainage Law of the State, approved March 8th, 1871, as amended March 19th, 1874, and that of 1881, chapter 158, and the act respecting sewerage and drainage, chapter 56, laws of 1880, are especially worthy of note, and seem to furnish all necessary power.

WATER SUPPLY.

No sanitary subject has more earnestly occupied the attention of our citizens the past year than this one of water supply. It has long been recognized in many of the cities of our State that other provisions than those now made must be had in the near future. The

wide-spread drought of the present season has affected almost every portion of the State. It has put to test the water supply of many places in such a way as to exhibit its insufficiency or to show its doubtful quality. An examination of our abstracts from local reports will show how wide-spread has been the scarcity. The failure of a few wells in dry seasons, in the country, is not of much significance. But when country towns and large cities have revealed to them the utter inadequacy of their supply, and their increasing liabilities to a water famine, or to impure water, we may well use the opportunity to acquaint ourselves with the best sources of supply. Good water and plenty of water are so essential that we cannot often afford to approach the edge of danger or of want. While we do not, like John Hunter, call it "a compound of every species of matter into which we find it capable of being converted," we do find that it can become the vehicle of almost every substance hurtful to our lives.

It is well, as a key to the subject, to bear in mind that water supply is very much a geological question. The nearness of water to the surface depends much upon the strata or formation of the ground. Next, the quality of the water, in a mineral sense, is affected by the minerals or ground structure it finds.

The soil which represents animal or vegetable decay has much to do with determining the quality of the water in what are called its organic constituents. The order and character of the strata determine how far the ground serves as a percolator or filter, and so has much to do with the purity of the water.

Remembering where it comes from, how shall we avail ourselves of it? Shall we catch it in a cistern, fresh from the clouds? or shall we take it from the rivers, where nature by her water-sheds and by her conformation keeps it exposed on the surface? Shall we get it from lakes, where nature gathers and holds it as if in her own great drinking bowls? Or shall we intercept in a similar way by artificial methods, and so make reservoirs along the edges or somewhere amid the contour of the hills? Or shall we make other reservoirs along the basins of rivers, and so seek to get the same supply, with that additional percolation which the ground between such well reservoirs and the river may afford? Shall we make artificial strainers by means of great filter beds, and purify the river on the same principle that we may purify even sewage?

We put these questions in succession, not fully to discuss them, but to fasten attention upon the fact that there are various methods,

natural and artificial, by which water is to be secured, and that the question of mode is to be determined by giving full weight to those kinds of evidence which, to a degree, must be special to each locality.

What is best for Trenton, on the Delaware, does not determine what is best for Newark, on the Passaic.

What is best for Princeton, on the shale, does not tell what is best for Vineland, in the sand.

Some of the river cities can do nothing better than to make every other value of their rivers bend to securing and preserving them as water supplies. Others can do nothing better than to value them chiefly as exits for sewage. Others may need them entirely for commerce, or as water ornaments. Now and then a river may be utilized both as a water supply and for the disposal of sewage, if only all the details of proper arrangement are fully carried out, and if the administration is complete.

Again, the quality of the water is not to be arrived at by generalizations. Some streams are polluted by the very substances and quantities of the substances by which other streams are not polluted. The evidences of the pollution of a stream are those of large probability, where it is shown that the character of the pollution is very degraded and the quantity very unusual. The chemical and microscopical tests tell much. The experiences of close observers, and especially of physicians, in accurately dealing with diseases and recording and studying effects, is a historical testimony of great value.

It is not negative evidence that no epidemic has occurred, for inferior water may tell on health in slow and insidious as well as in rapid and alarming ways. Thus, the question of water supply is one to be studied for localities and in localities, not alone by general statements, or by the promiscuous opinions of men, wise, no doubt, in their own departments of industry, but never having studied out the details of this subject. Yet be it known that in the hands of students and observers, these questions are as determinable as are fact-matters, or scientific and business questions in other directions.

The great error to which most towns are subjected, is that of entering upon a scheme that has not in it the elements of perfect success, because there has not been a full and exhaustive study of the best methods, and of what is best for that place. Science and art now make such knowledge practical, and right results attainable. For most towns and cities it is safest not to commit any important question of water supply to local decision, or to the execution of any one engi-

neer, until a report thereupon has been secured from several persons chosen with reference to their technical knowledge of locality, of population, of sanitary condition, etc.

Thus far, about thirty of our cities and towns have a special water supply, furnished either by water works at the expense of the city or by a water company. In some of these, wells and cisterns are also considerably used. When companies offer to run their own risk, and supply at their own expense, there should not be any less caution on the part of municipalities in satisfying themselves as to the quantity and quality that can be relied upon from the proposed source; for after the company in influence or power comes to overpower the corporation, or if the quality of the supply is unsatisfactory, the existence of such companies becomes serious hindrances. This caution is given with the knowledge, however, that some such supplies in our State are excellent, and the management fully in the interest of the citizens.

The Reform School, at Jamesburg, after the sickness there, had occasion to seek a new supply. The deep, large well did not furnish water of satisfactory quality. The plan now adopted is thus plainly described by the Superintendent, James H. Eastman:

"Its development and construction was briefly as follows: There were indications of water just over the crest of land 1500 feet to the south and east of our buildings, in the margin of a wood lot. At the highest practical point up this crest we dug a lateral trench some rods in length to a depth of about ten feet. We found much water in a stratum of white gravel and sand. A temporary outlet was made for it to run off down the side hill. The quantity seemed abundant, and the quality, from handling and use, satisfactory. Taking a few levels, it was apparent we could bring it by gravity to a more convenient place for storage and use. We continued the deep trench, therefore, across a shallow and through a ridge, with but two slight deviations from a true line, a distance of 950 feet. At this point we constructed a brick cistern to hold 12,000 gallons, arched over the top and nearly hid in the ground. When we would collect the water in the trench, we used common six-inch drain tile, and for its passage six-inch terra cotta pipe, laid in cement through the suspected places, shallows and clay beds. The water is admitted to the cistern opposite the overflow, and six inches above it. Thus, the water is kept in a constant state of agitation. Contiguous to this we made an *open reservoir*, of several hundred thousand gallons capacity, to take the overflow from the cistern, and conveyed thither also water from other parts, through drain tile. This was made for use in case of fire. We may draw water from either of these by the aid of two powerful steam pumps. For our further protection against fire we have laid *water mains*, with fire plugs, about our grounds, and purchased 600 feet of hose pipe."

It is quite certain that, in many localities, there must soon be a

change in methods of supply. The wells which were sufficient in our seaside villages, will not do when 100,000 people crowd upon the shore.

The ten acres of ground which gave pure water to Newark when the New England settlement took place, is not the ten acres which has since received thousands of tons of decomposing matter, and is covered with a population of thousands to a square mile. To some degree our people are realizing this. Some of the towns and cities are already well supplied.

Newark, Jersey City and Hoboken are not unmindful of the great problem that they must soon consider. Some of the seaside resorts which have depended on driven wells and cisterns, are seeking sources more abundant and such as will supply a population too compact for a driven well system in a cretaceous formation.

The following cities have water-works for artificial water supply:

Atlantic City,	Hackensack,	New Brunswick,
Bergen,	Hackettstown,	Passaic,
Bloomfield,	Hudson City,	Paterson,
Bridgeton,	Jersey City,	Perth Amboy,
Bordentown,	Lambertville,	Phillipsburg,
Burlington,	Long Branch,	Rahway,
Camden,	Millville,	Salem,
Cape May,	Morristown,	Trenton.
Elizabeth,	Mt. Holly,	
Flemington,	Newark,	

Asbury Park and Ocean Grove have recently formed a water company. Hoboken has arranged to be supplied from the Hackensack instead of the Passaic, and Bayonne has contracted with Jersey City. Red Bank, Princeton, Orange and other towns are seeking supply. Other places which have water works which were erected with faulty skill, or which drew from a too limited supply, are debating changes or additional sources. We only insist that the importance of adequate and healthy supply be considered, before it is impressed by serious inroads upon the health of the people, or by some violent outbreak of disease, and thus that forethought and administrative skill secure the ground and sources of supply before those complications occur which increase both the risk and the expense. While as the philosopher, Stephen Hales, puts it, "the All-wise Framer of these admirable machines has so ordered it as that their healthy state shall not be disturbed by every little variation," and has made us consistent with a very considerable latitude of variation, "it will not do for us to swing much further in our lines of departure."

SEWER DISPOSAL OF SEWAGE.

The question of how to dispose of sewage in large cities is one of vital concern. Where there is a general water supply it now seems almost settled that there must be a system of sewers. If so, what shall they carry? A natural answer is, have them do all possible service. Thus, they have been so built as to answer as drains to the soil, as carriers of all the liquid and semi-liquid matter of households, and of the storm water from the buildings and streets. With this, much refuse not very liquid is often floated along. With a good flow and a good outfall, such sewers are very convenient. Being large, they can easily be cleansed, and if properly policed, they obey that great law as to all such matters. "Get the material away within a few hours of its production." But such sewers are expensive, and if their sides are allowed to become foul, or if they have not free access to air or air flushing, as well as water flushing, they are apt to become filthy.

Of late, there has been much tendency to the small pipe system. This supposes a separate system for drainage, if necessary, and a separate plan for the storm water. It lays pipes for carrying sewage only, and is not intended to contain any matter that is not in a liquid or semi-liquid condition—that of the water closet being supposed to be easily soaked and reduced. Some would even exclude this, and depend therefor on a dry earth system. The choice of a system is often a question of locality. It is, therefore, better that any city considering what change to make, should consult the Board directly rather than rely upon general statements.

Whether the sewage shall be discharged into streams directly, or whether it shall be used to irrigate and fertilize a farm purchased by the city, or whether it shall be so filtered through soil as to leave in it its more solid contents, and deposit organic material so that the water left clear may soak into a stream, or whether it shall be dealt with by some chemical process so as to settle and separate the more valuable parts—all these are questions of locality and business expediency which, like all other valuable improvements or business operations, are to be stated with all the details, before preference or method can be certified.

But a more difficult question is, what to do in towns or villages in which a sewer system is impracticable. There are many communities in which there are two or three streets with houses as close as they would be in a city, where there is need of some organized system of

disposal, or where, at least, the householder needs to know how he can be best rid of all such material, and how he shall not suffer from his neighbor's nuisances a few feet from his back door. We have constant evidence that law needs to regulate such dwellings in these regards, in which the life and health of one's self and family are greatly involved.

There is also need of the best information to householders, since these evils arise not from malice aforethought, but often from the carelessness of the occupant, or the puzzle he is in to provide anything satisfactory. To such, a few suggestions may be of service.

I. *As to Quantity.*—There is a wastage in households that multiplies the bulk of substances to be removed, and so complicates the process. Even water may be so plentifully used as to cause dampness and disease, and to be difficult of riddance. So a first effort should be not to make a quantity such as shall complicate removal. Especially let there not be the embarrassment as to quantity from delayed removal. For this there are two reasons—the daily accumulation is often easily removed, when that of a week or more would be a burden. Then the keeping is evil, because it gives opportunity for that change or fermentation which so often causes foul air and disease.

II. *As to Separation.*—It is very important to keep distinct certain parts of household accumulations. There is a great deal of dust and dry dirt that is easily disposed of at once in the kitchen fire. Where there is no other use therefor, the leaves of vegetables, &c., after a day of drying, are easily disposed of in the same way. The ash heap should never be the receptacle of any other refuse; then it is easily carted away. Much of waste water is not so soiled but that it may be poured on the grass or around the vines or flowers a little distance from the house. A garbage barrel should represent nothing but kitchen refuse, and preserve its purity by being emptied or disposed of frequently, being occasionally rinsed out with a disinfectant when emptied.

There are some that contend for an entire separation of all wash room and chamber slops from any fœcal material. The urine and wash water, if daily emptied separately and not always on the same spot, will be very largely disposed of on a very small lot. The tub or half barrel, or the earth closet system, will take care of the usual family accumulation of the privy, with an easy system of methodical

change. The cesspool is objectionable, just because it is a store vault for filth, which is not injurious with daily removal, but the danger of which is in its storage. There are two ways of storing. One leaves the bottom and sides pervious, in order that the water may soak away into the ground, and so not so great a bulk accumulate. If the ground is porous, if it is of that composition or admixture which makes a good filter, if there are no wells near, this way will dispose of considerable dirty water. The more solid material left behind, if exposed to the power of earth and air, will partly dry away. But experience shows that it is a risky mass, which is sometimes capable of such changes as to induce serious disease. The other form of cesspool, and that usually the better form, is made cement-tight, like a cistern, in order that it may hold what gets into it, and may be emptied when full, which is now in cities generally done by the odorless excavating apparatus. While such storage of filth may do as a temporary resort, it is plain that we ought not to rely on this as a desirable method.

The small pipe and flush tank system seeks to substitute this as follows: The cesspool is substituted by a tank capable of emptying itself with a gush, by a syphon or by an automatic fixture known as a flush. It has going out from it a common drain pipe, branching off in all directions eight or ten inches under ground. These pipes are laid loose-jointed, so that the material thrown out may leak out and enrich the soil. This also allows full entrance of air. The effect of the flush is to clear the pipes quite differently from what they would be cleared if the liquid were allowed to dribble through. The plan is in operation at Princeton Seminary and a few other places.

If the flush tank is placed higher, and the flush takes place in trenches so arranged as that one may be used and then another, these being covered over in winter, it is surprising how easily they are managed. With any regularity of administration, and with very little expenditure of time, the usual waste and closet material is thus easily disposed of.

In most of our towns the great want is an inspector, who has been taught as to the best methods, and who, by two inspections a year, and suggestions, and by a report to the Health Board, would prevent or correct very many errors. The time has come when most of our cities need a health inspector as much as they do a mayor or an alderman. Some of our smaller towns that have adopted this plan have found it very advantageous.

LOCAL SANITARY SURVEYS.

This Board, soon after its formation, urged upon our larger towns and cities the necessity for such sanitary surveys and maps as would show the geological structure, the natural and artificial water courses, all underground constructions, and the surface topography. Such maps are not only essential for sanitary study, but as locating every structure and giving contour and gradients, they save much after expense. Hoboken, Jersey City, Elizabeth and Bayonne furnish excellent examples of skilled work in this direction. Specimens can always be seen at the office of the Board in the State House. Trenton, Princeton, &c., are now engaged on such maps. Some of the cities that had imperfect maps are making new surveys. There is now a conviction on the part of most of our Boards of Health, where the population is dense, that such a map is indispensable, and we trust that all our cities will see to it that the work is committed to skillful men, and that all the details are well combined.

SANITARY EXHIBIT.

In connection with the State Fair at Waverly there has been for the last three years a Sanitary Department, under the conjoint auspices of this Board and of the officers of the State Agricultural Society. The design has been to give opportunity for the exhibit of all those household and other appliances which are intended to guard the public health. The success of the exhibit this year was much greater than heretofore, and attracted crowds of visitors. Various forms of apparatus and appliances and systems of ventilation, of heating, of sewering, of emptying of cesspits, are thus open to view, and aid much in giving to the public information on these subjects. It is hoped that the exhibit will grow in interest from year to year, and will be of sanitary service to the State.

The New Jersey Sanitary Association continues its useful work in inquiring as to the special sanitary needs of localities, and in discussing the various advances in sanitary science and art. A *resumé* of its work for the last four years will probably be given in the next Report.

KEROSENE EXPLOSIONS.

In the second report of this Board, pages 16–22, and in the fourth report, pages 25–28, are given some facts as to the dangers arising

from the use of kerosenes that are unsafe. The same brand that last year killed a girl of twelve, has this year killed the mother of a small infant, within three miles of the same town. Evidence is constantly coming to us of the risk that is being run, especially among the poorer classes, who are the chief consumers of this dangerous explosive. Some tests made by one of our public analysts show that these lower grades of kerosene are to be found in almost every part of the State. There is need that wise legislation be had, such as shall impose no unnecessary burdens upon honest producers, but such as shall shield the public from a danger so serious to human life. The time has come when a stringent law on the subject would meet with public support and approval.

SMOKE AND STENCH NUISANCES.

The experience as to the Elizabeth nuisance of last year needs to be borne in mind (see fourth report). Owing to the stringency of the New York law, it is believed that many objectionable factories will incline to remove within the limits of this State. Already many localities complain. The rendering establishment near the Hackensack is unnecessarily malodorous. We have had occasion this year, in conjunction with a committee of the New York State Board of Health and the local Board of Bayonne, to examine the petroleum and other factories at Constable's Point. It is admitted that the odors are prejudicial to health and comfort. It is also now known that, by proper apparatus and oversight, most of the evil can be remedied. Already the Standard Oil Company and one or two others have introduced important and remedial improvements. Others continue to make an unnecessary nuisance. We ask that local Boards of Health attend to these evils and bring the force of persuasion and of law, if need be, to bear on their limitation. The Bergen Point nuisance is so serious a detriment to the people of Staten Island, that the Governor of the State, as well as the State Board of Health, have earnestly invited the attention of our authorities thereto. We find, too, that some of our cities incline to push their nuisances into country districts which need to be on the guard against such encroachments and see to it that all such material is rightly handled and utilized.

OUR SUMMER RESORTS.

The extent to which the New Jersey shore, from Sandy Hook to Cape May, is becoming a place of resort, cannot be overlooked in

the interests of public health. Tens of thousands are thus attracted within our borders, under conditions not always promotive of health. While they come to the sight of a pure sea and to a soil naturally free from organic matter, yet they have all the perils of a floating and non-housekeeping population. It is difficult for habits of regularity to be preserved as well as in the more staid and quiet household. Many come who are not in full health, and therefore are especially susceptible to unhealthy influences. Our interest as a State is not merely to secure their temporary sojourn, but to attract them and their descendants to more permanent settlement. Besides, these resorts have a sanitary relation to those who are already our permanent citizens. Multitudes of our own people are forced to go to these places in order to maintain their own equilibrium of health for the year.

Many of our cities are in such an inadequate condition for health that the only way to keep the death-rate within respectable limits is for a good percentage of the people to leave for the summer. Thus they are not only able to live themselves and to save some of their own children, but can point to a death-rate based on a full population the year round and argue against city improvements with more plausibility. I am satisfied that one of our counties and several of our cities would have an alarming death-rate if all the people stayed at home. But alas! some of the crowded city conditions are beginning to be found near the seashore. Slops and offal and excretions do not always find a proper disposal. Water supply is not always good. The laws of air space are not regarded. Houses and tents in sight of the sea may become foul, even though sea air blows over them. Some of these towns are being very rapidly built under no adequate sanitary direction. The desire for water seems so great that the rage for artificial ponds is well nigh irresistible. We could name several of these so-called lakes that are simply abominable, as are also some of the devices for making scanty natural lakes great beauties by the introduction of salt water and the flooding of adjacent land. There is such a thing as a safe artificial lake, but it is among the most skillful devices of the sanitary engineer. It often means the damming up and overflow, near the place of exit, of a natural water-course, and generally will mean malaria in some season when accumulation is sufficient and when climatic conditions favor. We warn the people against these malarial pockets, which will some time spread their influence. It was the intention of the Board to complete this year a work already begun, of a sanitary examination of all health resorts,

as to which we hope to state facts, more than opinions, including the conditions of hotels, etc. It is expected that it will be completed before our next report.

FIRE ESCAPES AND SUMMER RESORTS.

We have just at hand the following communication:

ILLINOIS STATE BOARD OF HEALTH,
SPRINGFIELD, Nov. 11, 1881.

To the Secretary New Jersey State Board of Health:

MY DEAR DOCTOR:—At the last quarterly meeting of this Board, the Secretary submitted a paper on the "Dangers of Summer Resorts," prompted, in part, by his personal experience in August last, at Beach Haven, N. J., when the Parry House was destroyed by fire. The rapidity of the combustion—the entire building being completely destroyed within an hour—the limited means of egress, and the time of occurrence of the fire (3 A. M.) rendered the escape of the inmates without loss of life little less than miraculous. The Parry House was in no essential respect different from the average hotel as found at many popular summer resorts, the most cursory examination of which would reveal the same insufficient provision for exit and a like flimsy and combustible character of structure.

After discussion by the Board, it was

"*Ordered*, That the Secretary be instructed to address a communication to the New Jersey State Board of Health, and to the Boards of Health of other States in which there are summer resorts, inviting attention to the subject; and respectfully recommending that, in case there are no adequate laws governing the construction of such buildings with reference to danger from fire, inspections should be made of these resorts covering this point, as well as the general sanitary conditions which obtain in and about such places—this recommendation being based upon the belief that the publication of reports of such inspections would go far toward securing a correction of the evils disclosed."

This Board will be glad to co-operate with you in any manner indicated, to the extent of its ability, either in this or any other direction, in the common labor of promoting the public safety.

Very respectfully,

JOHN H. RAUCH, M. D., *Secretary.*

EZRA M. HUNT, M. D., Sec'y.

The subject referred to is one of great importance, and has recently had the emphasis of a tenement house fire in New York, and the shocking disaster in Vienna. Few of our hotels are properly provided with means of exit. The same is true as to city school buildings and other public edifices. We earnestly direct the attention of all concerned to these defects, so that we may not depend entirely upon deaths by fire to popularize fire escapes.

REGULATION OF MEDICAL PRACTICE.

Within the last few years our Legislature has seen fit to return somewhat to the former habit of the State, in recognizing that there should be some guard upon the qualifications of those who deal technically and professionally with the lives of its citizens, and who administer to them articles which, in the hands of others, are prohibited from use as poisons. The first step in this direction was a law to guard against the ignorant dispensing of drugs, and for this purpose provided a Board of Pharmacy. The next step was the passage of a law, chapter 199, 1880, prohibiting from the practice of medicine and surgery in this State any person who had not in some form or other a diploma certifying his or her competency. This law very properly made no discrimination between those of different schools of medicine. It did not even intend to certify that all having diplomas are competent practitioners. But it did intend to say, that in so serious and important a business as the special care of human life, the person who offered his services as a physician or surgeon should at least have the testimony of some incorporated school or licensing body that the necessary preliminary studies had been pursued. The law was not the outcome of medical effort, but arose from glaring facts which had come to the notice of members of the Legislature, and especially from the exposures as to the bogus sale of diplomas in Pennsylvania. To this law an amendment was passed the last winter, not requiring a diploma registry from any person who had in one place been practicing medicine and surgery for twenty years.

The law, as it thus stands, is the mildest and the simplest that could be thought of if any effort at all is made to protect from uneducated or irresponsible practitioners. It is merely an attempt to put on record in each county the place and date at which, and the institution or authority from which any person claiming to be a practitioner of medicine and surgery has received credentials. In order to make the law effective for the purposes for which it is intended, there should be an index to these records, as made in the office of county clerks, so that all may be able to have that information to which all are entitled. It is also important as to the records of vital statistics, that those who, as physicians, give certificates of death, should be thus far authenticated. So soon as this is done, we shall hope to furnish a list of all practitioners recognized by the law.

LIBRARY.

It has from the first been the effort of the Board to secure such a sanitary library as should be of advantage to the citizens of the State, and especially to those who, in the interests of our people, have occasion to consult the best authorities. As Great Britain and the Continent have been so far ahead of us in the development of this science and art, most of the authorities have not been largely accessible here. Some of these, like the earlier English Health Reports, are difficult to secure, and yet are invaluable in the study of health problems and of vital statistics. The Board has enjoyed some special advantages for selecting and procuring the best literature on the subjects of heat and ventilation, water supply, drainage and sewerage, house construction, engineering, plumbing, and the many collateral subjects included in the care of the public health. We now have a library which, though not very large, will favorably compare with that of any other State or city Board on the subject, and it is worth much more than its original cost. A list of all books and pamphlets is given in this report, in order to acquaint the people with the best authorities, and also to give access thereto. The library will be open on every Friday from nine to twelve to any wishing to consult it. Boards of Health, or individuals, who may wish books for special study, may make an arrangement by which, at the expense of expressage, they may avail themselves of their use for two weeks.

In many cases very valuable articles are to be found on special subjects, scattered through the various sanitary journals and the reports of State Boards of Health, all of which are on file at the office. A careful examination of this catalogue will not only show the extent of subjects concerned, but also point to the most valuable sources of information.

METEOROLOGY AND CLIMATOLOGY.

The study of these has a two-fold interest for the citizens of our State. We need to determine the relations of climate as a cause of disease, or as modifying its symptoms or severity. It is found that the changes of the seasons, and that the constitution of the atmosphere, even for days or weeks, have an influence upon disease. Different conditions seem to favor different diseases. The actual influence is only to be ascertained by comparing the actual recorded state of the weather at any one time, or for a selected period, with the diseases

which have occurred during that period. Conclusions derived from any one comparison, or from a limited number of cases, either of occurrent weather or occurrent disease, would probably lead to erroneous conclusions. But if the accurate observer of weather puts on record his observations through sufficient periods, and the accurate observer of disease also the maladies that have happened and the phases they have shown, we have on hand the materials for a statement of the series of facts as to each, side by side. It is found that thus we are able to trace the relations of climate to disease, and so to guard against changes which, although they occur, admit of adaptation of the system to them, or avoidance of them. In any science or art such as this, facts must be collected long before their utility is apparent, since it is only by series of data that we arrive at safe conclusions. Thus far our chief aim has been to secure accurate observers, and a sufficient number of observations, to admit of future comparisons when the statistics of disease shall reach over sufficient periods.

There is another important reason for careful climatological records in the State of New Jersey. It is an established fact that certain climates agree best with certain persons, or with certain phases of disease. If we can determine where the corresponding or suitable climates are to be found, we are able to situate our own citizens, and especially those not in perfect health, in the climate best adapted to them, as also to indicate resorts adapted to those coming from other States or countries and seeking such adaptations.

New Jersey affords a wonderful field for such inquiry, and for the settlement of such adaptations, if by recorded observations we can be able accurately to define our climatology. Variety of climate is not determined merely by latitude or longitude. Even as to this, by its very shape, our State gives, for its size, unusual variety. But the sharp contrasts of our geological strata, the relations we bear to an extended sea coast, the forms of our bays and rivers, the character of our forests, the mountain tracks and the broken hill and valley contour of some sections present a diversity well worthy of the closest study in the interests of health and population. Many a consumptive goes South who could escape cold and malaria much better in our pine regions and on our warm and sandy seacoast than in the Florida Everglades. Many who need mountain air may find a home amid the high hills or the rocky ranges of Morris, Sussex and Warren counties better than in more distant mountains. We hope ere long, by a series

of tables, to be able to show these great diversities of climate as to locality, and yet its equability from year to year in selected spots. The Meteorological Report and the tables will be found near those of Vital Statistics, so that references and comparisons may be more readily made.

REPORT OF THE INSPECTOR OF MILK.

The milk law did not originate as a proposition of this Board. It was, we believe, first offered by a milk-producing association of this State that had been annoyed by the quantity of skimmed and diluted milk which had become an unfair competition to honest producers. Inasmuch as fraudulent milk is a great evil to the public health, we were asked to have such relation to it as to make choice of the inspector. With the execution of the law we have nothing to do. The inspector chosen was appointed after a competitive examination, and has been faithful in the execution of his trust. He has frequently communicated both with this Board and with the Council of Public Analysts. Relying upon no one instrument or method of detection, he has adopted the plans believed to be best adapted to protect the people from adulterations of this liquid. There are some defects in the law which need to be remedied. But these must not be used as a plea for destroying the principle of the law, and so making it, as the former law on our statute book was, practically worthless.

Many sanitary laws, and such as affect adulterations, must confer large powers and trust to the judiciousness of the officer. In case of arbitrary use of his powers, he is liable to the penalty of the courts. There can be no doubt that the reduction of milk in quality by the abstraction of cream, and its increase in quantity by the addition of water, is too common and too serious a matter to be overlooked. Milk is a great dependency in treating many diseases and in helping small children and invalids to resist disease. Besides, any such fraud is an offence against law and should be resisted. This Board does not believe it to be the policy or duty of the State to have an extended and costly system of inspectorship, but it rather seeks to have such an oversight as shall awaken the attention of localities thereto. All of our larger cities should have a local inspector or a system of license, and should put themselves in the position of protecting the people from so serious a fraud.

REPORT OF THE COUNCIL OF ANALYSTS AND INSPECTORS—ADULTERATION OF FOODS, ETC.

Under the law passed by the Legislature of 1881, the Board appointed the following Council of Analysts:

Prof. A. R. Leeds	Hoboken.
" F. C. Van Dyck	New Brunswick.
" H. B. Cornwall	Princeton.
Wm. K. Newton, M. D	Paterson.
Wm. H. Newell, M. D	Jersey City.
Shippen Wallace	Burlington.
Prof. C. F. Brackett, M. D., E. M. Hunt, M. D.,	Members *ex officio*.

An early conference was held with the Board, and the preliminary work outlined. Different departments of inquiry were assigned to such of the members as were to conduct experimental inquiries. The results have been such as we think will show the necessity of such investigations. We refer for details to the report herewith transmitted. It is evident that a larger appropriation is required if the work so well begun is to be of essential service. New York State has deemed the subject one of such importance as that an appropriation of $15,000 therefor was made the last year. While there are limits to the practicability of all such investigations as conducted by the State, it is a principle that whenever any system of fraud largely affects the citizens of a State, it should be guarded not only by law but by persons appointed to detect the fraud and to bring action against offenders. It is found that the wage classes are the chief sufferers from these deteriorations. The amount at present appropriated might be increased four-fold to the advantage of the State.

CONTAGIOUS DISEASES OF ANIMALS.

The duties of the Board as to contagious diseases of animals have been arduous during the past year. While the cases have not been numerous, yet constant watchfulness is required, and those that have occurred have presented complications in management. One lot affected with pleuro-pneumonia had so many owners that continued quarantine was inadmissible, and the slaughter of the herd became necessary. We have been able, in several instances, to prevent the spread of the disease. The present law has been of much service, but is awkward in its application and requires some modification. If we

are to be secure against contagious pleuro-pneumonia, swine-plague and anthrax, glanders and some other diseases becoming epidemic in the State and causing great losses, we must have the system of management clearly defined. The minutes of the Board as to it and other particulars will be found in the Report of the State Board of Agriculture, as required by the law.

The papers presented as a part of this report, will, we believe, be found useful in the households, cities and townships of the State. The summary of reports from localities has many suggestive facts. The Report of the Medical Superintendent of Vital Statistics will contain other facts and inquiries as to the diseases of the State.

THE RELATION OF THE STATE BOARD OF HEALTH TO OUR PUBLIC SCHOOL SYSTEM.

BY L. DENNIS, M. D.

The question may pertinently be asked, what has the State Board of Health to do with our public schools? The answer may be given broadly in the terms of the act creating that Board: "Be it enacted, That the Board shall take cognizance of the interests of health and life among the citizens of this State; they shall make sanitary investigations and inquiries in respect to the people, the causes of disease, and especially of epidemics, and the sources of mortality, and the effects of localities, employments, conditions and circumstances on the public health; and they shall gather such information in respect to these matters as they may deem proper for diffusion among the people."

When it is considered that the school children, from the ages of five to eighteen years, constitute about one-third of the population of the State, that they are in the main exposed to like "causes of disease, and especially of epidemics," that they are in similar localities, engaged in similar employments, surrounded by closely correspondent conditions and circumstances, and, lastly, when it is observed that among them is afforded an opportunity for the "diffusion among the people" of such information in regard to matters of life and health as is nowhere else presented in the State, it must be admitted that here the Board has all the conditions requisite for the prosecution of part of its work most favorably and uninterruptedly.

Nowhere else are gathered so many individuals engaged in the same occupation upon whom can be so thoroughly tested the various applications of a sanitary sort intended to preserve health and prolong life. Nowhere else can the causes of disease, and especially of epidemics, be so thoroughly investigated, for no class of the community is so liable to epidemics. As a body to be studied, therefore,

they present advantages unsurpassed. Unhealthy surroundings may be noted and their effects watched even when the causes are not removed or removable. Here, if anywhere, are found the conditions of intelligence and education in those who have the charge and direction of this mass of humanity, so essential to the proper carrying out of sanitary suggestions. For this reason appeals to boards of trustees in regard to the proper location and construction of school houses and outbuildings, the amount and direction of light admitted, the vital subjects of heating and ventilation, the proper furniture of the rooms, the discipline and personal habits of the pupils, in so far as they are matters of sanitary inspection and direction, are all more likely to be listened to and heeded. Upon each one of these subjects volumes have been written, and a vast amount of information, thoroughly practical and very valuable, has been spread before the community in such shape that it is easily accessible.

It would seem, therefore, that much good might be done by simply putting into the hands of those most interested in these matters such general rules as careful inspection of the working of our educational system shows to be most frequently violated, to the detriment of pupils and teachers. This being done, the Board will have merely gone over the surface of its duties and obligations in reference to this large and important class of society. Manifestly it will be of little permanent advantage to these persons to have housed them in properly constructed buildings thirty hours out of the week, if for one hundred and thirty hours during the same week they are living in conditions to breed disease and death. It will avail little to shield them from harm arbitrarily thus for a period of from five to twelve years, if both before and after this stage of life they may be surrounded by all that is most disadvantageous to growth and development. It must be said, however, that the Board does not propose to desert them thus ignobly, but by the diffusion of increased light and knowledge, to make their homes bright, healthy and happy, and thus extend its fostering care over them at all periods of life.

How can this work be most efficiently done? Legislative reports on matters of health unfortunately find fewer readers than recipients; the instruction of the press is fitful, erratic, incomplete and uncertain of reaching the class for which it is intended; the pulpit and the platform know and reveal almost absolutely nothing on these subjects; the State Sanitary Association meets once a year, and rouses up in the minds of those least in need of it the spirit of reform and some

activity to secure it; individuals here and there, sanitary and civil engineers, physicians, and intelligent, earnest, thoughtful laymen are exerting each his own influence in the right direction; but there is no systematic, well-directed, persevering effort in any community to learn or to teach all that may be known on these matters, much less to put in practice the knowledge acquired. A careful consideration of the subject, then, forces upon us the conviction that in the schools themselves we have the most complete, well arranged and thoroughly efficient agency, not only for their own protection and improvement, but for the diffusion of such knowledge throughout the State, among all classes of its people, as shall, in one generation, correct abuses, secure the enactment of, and obedience to, right sanitary laws, and, in a word, reform the habits of our whole population. To secure these results there should be systematic instruction in all grades of schools and educational institutions in anatomy, physiology, hygiene and general sanitary science, and combined with these such physical exercises as are best adapted, in each grade, to strengthen and develop harmoniously the whole body, while the mind is under training, both by this and other discipline, for its own proper work in the future. This is no new or utopian scheme. Some of the leading educators and scientists of both England and America have been most earnestly advocating its claims upon the attention, not only of those who have the direction of our schools and colleges, but of all who have at heart the welfare of the public.

William Jolly, of England, to whom we are indebted for the principal dates of the following historical sketch, observes that, as early as 1818, the German educator, Pestalozzi, recommended physical education. In 1819, George Combe, the English writer and teacher, began the recommendation of the teaching of physiology and hygiene in schools, and continued his efforts for this object unceasingly till his death, in 1858. By lectures, addresses, books, pamphlets, and by practical instruction in schools, this eminent worker did much to popularize the subject both in England and this country. In 1828, Charles Maclaren, editor of the *Scotsman*, published five articles in that paper on the subject of education, in which he recommends it. In 1831–33, James Simpson lectured on it in different parts of Great Britain. In 1834, Dr. Charles Caldwell issued at Boston his "Thoughts on Physical Education." In 1837, Dr. Horace Mann, of Massachusetts, published a lecture on "The Means and Objects of Education," advocating it. In 1848, William Lovett was the first to

teach physiology in a common school in England. In the same year it was first taught in Scotland, in the Williams School, Edinburgh, by George Combe and Mattiew Williams. In 1850, the teaching of physiology and hygiene in common schools was established by law in Massachusetts, as follows: "Sec. 1. Physiology and hygiene shall hereafter be taught in all the public schools of this Commonwealth, in all cases in which the school committee shall deem it expedient. Sec. 2. All school teachers shall hereafter be examined in their knowledge of the elementary principles of physiology and hygiene, and their ability to give instruction in the same." In 1851, William Lovett published in England his "Elementary Anatomy and Physiology for Schools and Private Instruction," the first practical text-book for use in schools. In the same year Dr. Roth, in his "Exercises and Movements According to Ling's System," was the first to advocate scientific physical education in England. In 1853, sixty-five of the most eminent and distinguished physicians of London, including the principal instructors in anatomy and physiology and the practice of medicine and surgery in that metropolis, and also all the medical officers of the royal household, signed the following memorial to the English government:

"*Medical Opinion on the Importance of Teaching Physiology and the Laws of Health in Common Schools.*—Our opinion having been requested as to the advantage of making the elements of human physiology, or a general knowledge of the laws of health, a part of the education of youth, we, the undersigned, have no hesitation in giving it strongly in the affirmative. We are satisfied that much of the sickness from which the working classes at present suffer might be avoided; and we know that the best directed efforts to benefit them by medical treatment are often greatly impeded, and sometimes entirely frustrated, by their ignorance and their neglect of the conditions upon which health necessarily depends. We are, therefore, of opinion that it would greatly tend to prevent sickness, and to promote soundness of body and mind, were the elements of physiology, in its application to the preservation of health, made a part of general education; and we are convinced that such instruction may be rendered most interesting to the young, and may be communicated to them with the utmost facility and propriety, in the ordinary schools, by properly instructed school masters." London, March, 1853.

This opinion, which was drawn by George Combe, "was deposited in the hands of the government, and a large impression of it was printed and circulated." The government gave effect to it by ordering the preparation of an elementary work on "Physiology Applied

to Health," and "Marshall's Physiological Diagrams," to illustrate it, for the use of schools, and by instituting examinations in physiology, and making a certificate of ability to teach it a title to an increased allowance of pay.

In the year 1854 the eminent English physician, Dr. Paget, delivered a lecture at the Royal Institution of Great Britain, on the "Importance of the Study of Physiology," in which he claimed for it two classes of advantages: 1st. The science itself would be benefited by the creation, in this manner, of a greater number of observers. Also, by securing thus, co-operation and mutual understanding among all scientists—since all would have had some physiological instruction —a ground-work of common language or terminology would be laid here for future use. Again, this teaching would point out early in life those who have aptitude for the science itself. 2d. The advantages to the student, physical and mental, would consist in guiding to the improvement of his health by teaching the economy of his powers; also, in providing worthy materials for thought; likewise, in cultivating peculiar modes and suggesting ends of thinking. He would have not merely the facts, but chiefly the general principles of the science taught. For example, the principle of the economy of force in the system he admirably illustrates by observation of the alternate action and repose so necessary to the continuance of all healthy muscular, nervous and digestive functions. Hence, with these general principles he would combine useful rules of health. One so instructed would, he claims, be prepared to receive the higher truths of sanitary and medical science. Among the chief advantages of physiological teaching, in his judgment, are these: 1st. That it is confessedly a science of uncertainties, thus teaching its students to weigh, think and decide, and not merely to receive and believe. 2d. It is a science of designs, and thus happily adapted to answer the questions, "Why?" "Of what use?" so frequently asked by children in the prosecution of their studies. These he ably and beautifully illustrates by a statement of some of the arrangements for the circulation of the blood, respiration, the history of the development of the wings, legs, heart and blood cells of the chick, and the wonderful provisions for the repair of damaged organs in the lowest as well as the highest orders of animals.

In the same year, 1854, Professor Huxley, in an address at St. Martin's Hall, on "The Educational Value of the Natural Historical Sciences," claimed for physiological science the very highest value as

a branch of knowledge—teaching, like all science: 1st. Observation of facts, including experiments. 2d. Comparison and classification, or the formation of general propositions. 3d. Deduction, or the return from general propositions to facts. 4th. Verification, or proof of previous inferences.

Its value as discipline he regards as due to its training and strengthening of common sense, and its great exercise of the faculties of observation and comparison. Of its practical value he considers it hardly needful to speak, it is so self-evident. In closing, he says: "It appears to me that, as with other sciences, the common facts of biology, the uses of parts of the body, the names and habits of the living creatures which surround us, may be taught with advantage to the youngest child. Indeed, the avidity of children for this kind of knowledge, and the comparative ease with which they retain it, is something quite marvelous. I doubt whether any toy would be as acceptable to young children as a vivarium of the same kind as, but of course on a smaller scale than, those admirable devices in the Zoological Gardens." * * * "Leave out the physiological sciences from your curriculum, and you launch the student into the world undisciplined in that science whose subject-matter would best develop his powers of observation; ignorant of facts of the deepest importance for his own and others' welfare; blind to the richest sources of beauty in God's creation; and unprovided with that belief in a living law, and an order manifesting itself in and through endless change and variety, which might serve to check and moderate that phase of despair through which, if he takes an earnest interest in social problems, he will assuredly sooner or later pass."

Fourteen years later, in an address on "A liberal education, and where to find it," before the London Working Men's College, he said:

"Suppose it was perfectly certain that the life and fortune of every one of us would, one day or other, depend upon his winning or losing a game at chess: Don't you think that we should all consider it to be a primary duty to learn at least the names and the moves of the pieces; to have a notion of a gambit and a keen eye for all the means of giving and getting out of check? Do you not think that we should look with a disapprobation amounting to scorn, upon the father who allowed his son, or the State which allowed its members, to grow up without knowing a pawn from a knight?

"Yet it is a very plain and elementary truth that the life, the fortune and the happiness of every one of us, and more or less of those

who are connected with us, do depend upon our knowing something of the rules of a game infinitely more difficult and complicated than chess. It is a game which has been played for untold ages, every man and woman of us being one of the two players in a game of his and her own. The chess-board is the world, the pieces are the phenomena of the universe, the rules of the game are what we call the laws of Nature. The player on the other side is hidden from us. We know that his play is always fair, just and patient. But also we know, to our cost, that he never overlooks a mistake or makes the smallest allowance for ignorance. To the man who plays well, the highest stakes are paid, with that sort of overflowing generosity with which the strong shows delight in strength. And one who plays ill is checkmated without haste, but without remorse.

"My metaphor will remind some of you of the famous picture in which Retsch has depicted Satan playing at chess with man for his soul. Substitute for the mocking fiend in that picture, a calm, strong angel, who is playing for love, as we say, and would rather lose than win—and I should accept it as an image of human life.

"Well, what I mean by education is learning the rules of this mighty game. In other words, education is the instruction of the intellect in the laws of Nature, under which name I include not merely things and their forces, but men and their ways; and the fashioning of the affections and of the will into an earnest, loving desire to move in harmony with those laws." "That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does, with ease and pleasure, all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold logic engine, with all its parts of equal strength, and in smooth, working order; ready, like a steam engine, to be trained to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of Nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience, who has learned to love all beauty, whether of Nature or of art, to hate all vileness, and to respect others as himself." So far short, in his judgment, do the English schools come of his ideal, that he says English fathers must say to their sons: "At the cost of from one to two thousand pounds of our hard-earned money, we devote twelve of the most precious years of your lives to school.

There you shall toil, or be supposed to toil; but there you shall not learn one single thing of all those you will most want to know, directly you leave school and enter upon the practical business of life."

In 1855 Prince Albert recommended the teaching of physiology in schools, in a speech delivered at Birmingham. In the same year Dr. Hodgson taught it to a large number of teachers and pupils in Heriot's Hospital, Edinburgh, using Lovett's Diagrams. These lectures were said to have "marked quite an era in the spread of physiological knowledge." In 1858–9 he also gave courses on it to working men and others in various places. In 1859 Herbert Spencer published his article on "Physical Education" in the *British Quarterly*, which has since appeared in his "Education," published by Appleton, in this country, in 1860. In the latter admirable and most suggestive work, Mr. Spencer classifies the leading activities which constitute human life in the order of their importance, thus: "1. Those activities which directly minister to self-preservation. 2. Those activities which, by securing the necessaries of life, indirectly minister to self-preservation. 3. Those activities which have for their end the rearing and discipline of offspring. 4. Those activities which are involved in the maintenance of proper social and political relations. 5. Those miscellaneous activities which make up the leisure part of life, devoted to the gratification of the tastes and feelings." Hence he infers the rational order of subordination of various kinds of knowledge, or education, to be correspondingly: "That education which prepares for direct self-preservation; that which prepares for indirect self-preservation; that which prepares for parenthood; that which prepares for citizenship; that which prepares for the miscellaneous refinements of life." He remarks, "we do not mean to say that these divisions are definitely separable. We do not deny that they are intricately entangled with each other in such a way that there can be no training for any that is not in some measure a training for all. Nor do we question that, of each division, there are portions more important than certain portions of the preceding divisions; that, for instance, a man of much skill in business, but little other faculty, may fall farther below the standard of complete living than one of but moderate power of acquiring money, but great judgment as a parent; or that exhaustive information bearing on right social action, joined with entire want of general culture in literature and the fine arts, is less desirable than a more moderate share of the one joined

with some of the other. But, after making all qualifications, there still remain these broadly marked divisions; and it still continues substantially true that these divisions subordinate one another in the foregoing order, because the corresponding divisions of life make one another *possible* in that order.

"Of course the ideal of education is complete preparation in all these divisions. But failing this ideal, as in one phase of civilization every one must do, more or less, the aim should be to maintain *a due proportion* between the degrees of preparation in each. Not exhaustive cultivation in any one, supremely important though it may be—not even an exclusive attention to the two, three or four divisions of greatest importance; but an attention to all—greatest where the value is greatest, less when the value is less, least when the value is least. For the average man (not to forget the cases in which peculiar aptitude for some one department of knowledge rightly makes that one the bread-winning occupation), for the average man, we say, the desideratum is a training that approaches nearest to perfection in the things which most subserve complete living, and falls more and more below perfection in the things that have more and more remote bearings on complete living." * * * "If any one doubts the importance of an acquaintance with the fundamental principles of physiology as a means of complete living, let him look around and see how many men and women he can find in middle or late life who are thoroughly well. Occasionally only do we meet with an example of vigorous health continued to old age; hourly do we meet with examples of acute disorder, chronic ailment, general debility, premature decrepitude. Scarcely is there one to whom you put the question who has not, in the course of his life, brought upon himself illness which a little knowledge would have saved him from. Here is a case of heart disease consequent on a rheumatic fever that followed reckless exposure. There is a case of eyes spoiled for life by over-study. Yesterday the account was of one whose long enduring lameness was brought on by continuing, spite of the pain, to use a knee after it had been slightly injured. And to-day we are told of another who has had to lie by for years because he did not know that the palpitation he suffered from resulted from overtaxed brain. Now we hear of an irremediable injury that followed some silly feat of strength; and again of a constitution that has never recovered from the effects of excessive work needlessly undertaken. While on all sides we see the perpetual minor ailments which accompany feebleness.

"Not to dwell on the natural pain, the weariness, the gloom, the waste of time and money thus entailed, only consider how greatly ill health hinders the discharge of all duties; makes business often impossible, and always more difficult; produces an irritability fatal to the management of children; puts the functions of citizenship out of the question; and makes amusement a bore: Is it not clear that the physical sins—partly our forefathers' and partly our own—which produce this ill health, deduct more from complete living than anything else? and to a great extent make life a failure and a burden instead of a benefaction and a pleasure?

"To all which add the fact that life, besides being thus immensely deteriorated, is also cut short. It is not true as we commonly suppose, that a disorder or disease from which we have recovered leaves us as before. No disturbance of the normal course of the functions can pass away and leave things exactly as they were. In all cases a permanent damage is done—not immediately appreciable it may be, but still there; and along with other such items which nature in her strict account-keeping never drops, will tell against us to the inevitable shortening of our days. Through the accumulation of small injuries it is that constitutions are commonly underminded, and break down long before their time. And if we call to mind how far the average duration of life falls below the possible duration, we see how immense is the loss. When to the numerous partial deductions which bad health entails, we add this great final deduction, it results that ordinarily more than half of life is thrown away.

"Hence, knowledge which subserves direct self-preservation by preventing this loss of health, is of primary importance. We do not contend that possession of such knowledge would by any means wholly remedy the evil. For it is clear that in our present phase of civilization men's necessities often compel them to transgress. And it is further clear that, even in the absence of such compulsion, their inclinations would frequently lead them, spite of their knowledge, to sacrifice future good to present gratification.

"But we do contend that the right knowledge imparted in the right way would effect much; and we further contend that as the laws of health must be recognized before they can be conformed to, the imparting of such knowledge must precede a more rational living, come when that may. We infer that, as vigorous health and its accompanying high spirits are larger elements of happiness than any other things whatever, the teaching how to maintain them is a teaching that yields

in moment to no other whatever. And therefore, we assert that such a course of physiology as is needful for the comprehension of its general truths and their bearings on daily conduct, is an all-essential part of a rational education.

"Strange that the assertion should need making! Stranger still that it should need defending! Yet are there not a few by whom such a proposition will be received with something approaching to derision? Men who would blush if caught saying Iphigénia instead of Iphigeniá, or would resent as an insult any imputation of ignorance respecting the fabled labors of a fabled demi-god, show not the slightest shame in confessing that they do not know where the Eustachian tubes are, what are the actions of the spinal cord, what is the normal rate of pulsation, or how the lungs are inflated. While anxious that their sons should be well up in the superstitions of two thousand years ago, they care not that they should be taught anything about the structure and functions of their own bodies—nay, would even disapprove such instruction. So overwhelming is the influence of established routine! So terribly in our education does the ornamental override the useful!"

In 1860 Mrs. Bray published her "Physiology for Schools." In 1861 physiology is specifically named in the list of the Science and Art Department in England for which grants are offered. In the same year it was recommended for schools in the report of the Educational Commission of that country.

In 1871 it was included and paid for by the English government as a specific subject in the common schools. In 1872 the same took place in Scotland. From about 1860, text-books, charts and the means of instruction in this subject rapidly increased in England, and some few were issued, though not as numerously, in this country. Still, abundant, cheap and valuable resources are now easily to be had for the study and teaching of those important subjects. In December, 1880, at the meeting of the American Public Health Association, at New Orleans, Hon. John Eaton, United States Commissioner of Education, in an able address on the subject of "Sanitation and Education," warmly advocated the teaching of hygienic or sanitary science in all our institutions of learning.

Much more of the same tenor, and equally valuable in support of this subject, might be adduced from the writings of Drs. Routh, Edward Smith, Lankester and Angell, of England, but enough has been given to ndicate clearly the importance which all thoughtful

men, who have given any attention to the subject of education, attach to this vital matter.

It may be well to define, at the outset, a little more clearly what we mean by saying that there should be systematic instruction, in all grades of schools and educational institutions, in anatomy, physiology, hygiene and general sanitary science. By systematic, we do not mean exhaustive, but conducted upon a basis of reason and judgment, and at the same time, continuous.

To be systematic at all, it must be adapted not only to the present capacities, but to the future wants of those taught. It should, therefore, not be of such minute and detailed character as is fitted to prepare persons for medical graduation, but rather a simple description in popular language, though scientifically correct, of all the organs of the body, their functions, relations to each other, and the conditions which increase or impair their efficiency. The organs should be illustrated and exhibited, so far as possible, by anatomical preparations, by specimens from the animal kingdom, or by plates and diagrams. A slaughter-house, so easy of access from every school, a rat or mouse trap, a barn yard and a fish pond, would furnish abundant material for the study of the bones, muscles, nerves, joints, skin, hair, brain, eye, ear, nose, tongue, digestion, circulation, respiration and excretion, with all their attendant organs. In these the youngest child would be interested, the most advanced pupil find ample stores of knowledge and full scope for the exercise of his highest powers of observation, comparison, deduction and verification.

The field is so immense that it is only limited by the capacities of the pupil and teacher; so fascinating that to the great majority of students, no other subject in the whole school course would present attractions comparable to it. Children crave facts, they delight in sensible, tangible objects; hence, those studies which put them upon the use of their faculties in a natural, healthful way, which offer them knowledge, so to speak, in concrete rather than abstract forms, give them objects to handle rather than laws to endeavor to comprehend, are the ones which they most enjoy and pursue with the greatest avidity. Just in this meeting of the wants of young minds lies the peculiar attractiveness and fitness of these studies. No mind so young, of ordinary school children, but can appreciate something of the beauty which resides in mere animal forms. In proof of which see how tenderly and admiringly one such will handle and caress even a dead bird or mouse which it has found; how it will watch by the hour

the motions of its pets, how keenly their habits are observed, and how, oftentimes, their peculiarities are pointed out, for the first time, to parents who had not before noticed them. From external form and movement the mind naturally seeks to peer within, as witnessed by the multitudes of broken toys sacrificed in early years to find the hidden spring or wheel which contains the mystery; hence nothing will so delight them as to search out the secrets of the life, the motion, circulation, nervous actions, the wonderful complexity of parts that go to make up the living organism.

The study of physiology, then, in primary schools, prosecuted in this way with all the aids of animal life brought in both by teacher and pupil, the latter stimulated to observe, to collect specimens, to ask questions, to investigate on his own behalf, and thus in his turn quickening the teacher to increased activity in preparation for each day's work, becomes no longer a matter of dry drudgery and mere memorizing of names, but a living pursuit, rousing into keenest action every faculty of the child's nature, storing his mind with facts of immense practical value for all time, and so disciplining his powers of observation, attention, reflection, inquiry and comparison that whatever his after-occupation in life he will be the better student, the more efficient worker, and in all probability the more accomplished and successful man. In connection with this kind of study there are abundant opportunities for inculcating the simple rules of hygiene as to cleanliness of person, bathing, friction, the care of the teeth, hair, nails and clothing. From observation of the habits of animals and their peculiarities of constitution, useful lessons in the kinds of food best suited to man may be derived and impressed. Combined with this instruction, which we hope soon to see given in buildings properly constructed, furnished, lighted, heated and perfectly ventilated, there should be such alternation of rest and study, such use of light gymnastics on the basis of what is known as "Ling's System of Free Movements" without apparatus, that their young frames, instead of being cramped, bent, round-shouldered and narrow-chested, should all be erect, full-chested, with vigorous circulation, free and deep respiration, and the muscular system throughout harmoniously developed. So the primary school room becomes a miniature world, receiving instruction from all outside life that may be made helpful for future usefulness.

Passing to schools of intermediate and higher grade, the range of instruction becomes more widely extended. Here is possible a more

thorough and careful study of parts, a more comprehensive view of their functions and interdependence, more varied comparisons with other animal forms, bringing into greater prominence the marvelous unity in variety existing in the whole animal creation. As the study becomes more minute, the aid of the microscope or the simple lens may be invoked at a trifling expense, revealing a new world hidden beneath the one exposed to ordinary gaze, showing not merely in the structure of each part something wonderful and before unsuspected, but how, upon and within each part, dwell myriads of lower orders of existence, dormant, yet ready, upon the decline in vigor of that part, to start into new activity of their own and complete the destruction which bad habits or unwise mode of life in the subject may have begun. Thus at the outset of his career the student may be guarded against some forms of disease which the latest and most improved methods of scientific investigation have revealed, in the shape of germs, to the comprehension and perception of all observers.

With these enlarged views of anatomy and physiology thus taught would go hand in hand more complete hygienic counsel, reaching to all the details of individual habits—such as care of eyes and ears, times of study, recreation and outdoor exercise, amount of sleep, quantity and quality of food and drink, times of eating and drinking; also clothing for head, feet and body. In addition to these matters which pertain to the individual, should come instruction at this period, or as the children are able to understand it, in matters pertaining to collections of persons, as in the house, the village, town and city, the school, the church and the public assembly.

In this way much practical information in regard to lighting, heating and ventilating dwellings, churches and public halls; the proper arrangements of cellars, dining, sleeping and sitting rooms, kitchens, bath rooms and water closets, house drainage, water supply, and the thousand matters especially which go to make home and social life healthful or disease-producing.

Thus may be laid the foundation of general sanitary science in minds prepared by previous habits of observation and reflection to estimate their worth and importance. It is not to be supposed that this instruction can be complete or very minute; but it may be sufficiently so to arouse an interest in the subject, to set these young minds to inquiring, reading and investigating for themselves, and thus reveal to them how much is to be learned and how immense may be the value of such knowledge.

Accompanying each day's study and discipline of mind in this grade, may be introduced a wide range of calisthenics, a greater variety of exercises with or without simple apparatus, increasing muscular power, and perfecting the development begun in the primary schools. These, judiciously used during school hours, rest the mind, draw the blood from the crowded brain, inflate the lungs, quicken the circulation, destroy worn-out tissue and make a demand for new material, an increased supply of blood and plenty of good food; appetite and digestion are improved, and mind and body are strengthened together.

In the higher institutions it need hardly be said that the study of biology, or physiology in its wider application to all animal life, with anatomy, human and comparative, gives scope for the fullest exercise of the best disciplined minds, and is itself, according to the testimony of the greatest living teachers of those sciences, not only knowledge of the very highest value but a discipline unsurpassed. Here may be used every variety of gymnastic exercise fitted to develop manly and womanly forms in their greatest perfection, and to lay up a store of strength and constitutional vigor which may suffice to carry the possessor well forward in the work of future life, and above all establish habits of daily attention to those matters which, with very little consumption of time, shall secure the most perfect growth, the fullest employment and the most continuous health and durability of all the faculties of mind and body.

At this part of the course the most complete and scientific instruction in personal hygiene, together with sanitary science, as it affects not only individuals, but general society in cities, towns and villages, should be given. The great questions of food, air and water, refuse, soil, drainage, buildings, quarantine, and all the vital matters affecting the public health, which, in their variety, complexity, yet beautiful harmony, are now universally recognized as constituting a science, should receive the fullest attention.

Such instruction as has now been barely outlined or hinted at, we regard as subserving the public health in the most radical and thorough way possible. Each pupil in his measure and capacity becomes a sanitarian, an observer, a student of the laws of health and right living, and, above all, an obedient servant of those laws, so far as is possible, from his earliest years. Each one becomes an instructor of others in the daily intercourse of life, and so the knowledge is diffused. Each home founded by such a student is constructed and conducted more

nearly in accordance with the principles of health than has ever before been possible. *Therefore, we hold it incontrovertible, that to labor for the bringing about of this most desirable condition of the educational institutions of the State is one of the highest and most imperative duties of the State Board of Health.* In no other way can the work of the Board be so efficiently carried on to the consummation of making each individual in the community self-helpful. By it both mind and body are harmoniously developed; many forms of sickness now due to indiscretion, lack of knowledge and unsanitary surroundings, are prevented; disease when once introduced into the system is intelligently combated; the efforts of the physician are ably and conscientiously seconded by persons who have given thought and study to the care of the health. The instruction is given under circumstances to make it most lasting, since early impressions are, as a rule, the deepest, most vivid and most enduring; the faculties are then most acute, and the judgment least biased by considerations of a selfish or pecuniary sort which might interfere with the carrying out of reforms. It is continued through a period of from one to fifteen years, made alive by dissection and experiment, forced upon the conviction by numerous and varied illustrations, and in every way brought home to the pupils in the activities of every-day life. In no other way can such vast numbers be reached; since about two hundred thousand children and youth attend school a part or the whole of each year, a larger and more constant class than is instructed by any other agency. In this large body of pupils are found representatives from all ranks in life, the high and low, rich and poor, learned and ignorant, all of whom would be alike taught what is wisest and best in sanitary matters. So a most powerful influence would be exerted, not only on the future well-being of these, but they in turn would be instructors of their parents, and thus extend the reforming influences over all the existing homes in the State. Many of the latter could only be reached otherwise, by the direct visit of a public inspector, which comes so infrequently as to make it, for all purposes of a thorough renovation, practically worthless.

Consider again that in a period of ten to twenty years, these pupils are to become the heads of families, and in new homes this knowledge, reproduced, will become operative in every household, at the cradle, the fireside, the table, and dealing with the minutest affairs of every life, will produce its results in a stronger race, freer from inherited taint, and better fitted to carry on active work to a vigorous old age.

The London Spectator, in a recent issue, commenting on the condition of sanitary science in that country, asks pertinently: "Do we live longer, or are we only slower in dying?" Learning that the expectancy of life in London had "risen a whole year within the last decade," it remarks, "But we want to know accurately a little more, and what is the kind of life which is increasing—whether it is young life or mature life, or aged life which is being enlarged? Are we young longer, or mature longer, or old longer? * * * Do we live longer, in fact, or are we only a little slower in dying?" He observes, "We should ourselves say, with a very strong conviction, that in England nearly the whole gain had been made between sixty and seventy; that the number of men who 'failed' between sixty and seventy, that is, who became old, lost their eyesight, or were otherwise impaired, was decidedly less; that a man of sixty-five was visibly younger than he would have been at the same age forty years ago."

The London Lancet, commenting on this article, remarks: "If to the prolongation of lives which have been trained in the school of experience can be added a diminution of casualties among those who are entering life or passing through its most critical stages, the ultimate result may be an army of more trustworthy veterans and more vigorous recruits, together forming a community such as the world has not hitherto witnessed.

"It is one thing to live long, another to die slowly. If it could be shown that men were not so well able to fight the battle of life at a mature age as they used to be, there would be room to question the value of such an improvement of human health as has been effected. Confessedly, the community could not be held to be advantaged by the prolongation of useless or powerless lives. To drag out a joyless and purposeless existence would be a curse rather than a blessing; but so far as the facts are set out in the remarkable article on which we are commenting, there is nothing to show that human health has not been substantially improved, while death has been deferred."

On the other side of this question, however, Dr. J. M. Granville, an eminent English physician, in a letter to *The Spectator*, says: "In result of a somewhat large acquaintance with the facts held to indicate the state and progress of 'human health,' I fear my testimony must be given to show that the improvement effected by science consists in a prologation of the passive endurance of life, rather than an exten-

sion of the period of true vitality, or any increase of the opportunity for good work and real intellectual enjoyment. We may 'live' longer, but our lives are not either happier or more useful, for the excessive energy recently devoted to the conservation of health, or the inordinate and laborious means taken to avoid disease and death. It may, doubtless, be possible to raise humanity to the level of one of those scientific toys which approximate perpetual motion, but expend their whole force in moving themselves. Whether longevity purchased at the price of passing a lifetime in running from death would be worth having, I must leave to be determined by the judgment of those who set a value on our so-called sanitary progress, which I, for one, fail to recognize.

"I think men were happier and better, and lived nobler lives, before the pursuit of health and the yearning for longevity became a craze, almost amounting to madness. What to eat, drink, and avoid, what to wear, where and how to live, by what means to avoid infection, to keep off disease, and to escape death for a few weary and worried years, are questions which so engross the thoughts, if they do not embitter the lives of the multitude, that the proposition, 'Is a sanitary life worth living?' has come to be a subject of serious contemplation, and one which the taxed and harassed community will sooner or later be compelled to entertain."

We have quoted thus at length from these three authorities to show clearly the state of feeling among thoughtful men, medical and otherwise, as to the results thus far attained by sanitary science. *The Spectator* and *The Lancet* hope and believe that good has been already accomplished; Dr. Granville evidently thinks the results not worth the pains.

In my judgment, sanitarians have begun at the wrong end of the course, or in the middle, rather than at the beginning. As well might we expect to teach a party of men who had no knowledge of arithmetic, geometry and trigonometry, properly to construct a railroad through a mountainous country, with all its difficulties and dangers of curves and grades, embankments and cuts, bridges and trestles, culverts and tunnels, as adequately to guide and direct, in the intricacies of modern civilization, one who had received absolutely no instruction at all in the fundamentals of living. What wonder that there should be a dragging through "weary and worried years," an embittering of the "lives of the multitudes," a "taxed and harassed community," over questions unsolved, doubts raised only to be par-

tially met and answered, and numerous perplexities for the disentangling of which there has been no previous training or discipline?

A child trained from earliest years in obedience to law, be it parental or civil, finds no worry or fret in later life in conforming thereto.

Just so a community, rightly instructed in matters of health from infancy, will find it as natural and easy to live rightly, as another, untrained, to live wrongly. Who can doubt that such education, carried on conscientiously and persistently for a generation, will add to the individual length of years, and markedly delay the period of decay of vital powers, so that lives would thus be greatly increased in efficiency and happiness?

The reforms in the individual life and the household, of which we have been speaking, would reach, also, to collections of individuals, the workshop, all trades and professions, the village, town and city. Unsanitary conditions being removed from the homes, the schools and the places of business and recreation, what would prevent the growth, in intellectual and physical vigor, of the whole people of the State? Were the same plan pursued in every State in the Union, who can measure the national benefits conferred thereby? The bulletins issued weekly by the National Board of Health show an average mortality, for most of the cities reported, of from 20 to 30 per thousand for the year. Some of the best living sanitarians believe that, even with the present condition of our people, by proper attention to hygiene, this might be reduced to even less than 10 per thousand. With a population of 50,000,000, this would effect an annual saving of about 500,000 lives. Can any one doubt that in a generation this economy of life would even be increased, by reason of the gradual improvement wrought in the condition of all classes? The productive power, and so the cash value, to the nation, of these lives alone, would be many millions of dollars; the saving due to the avoidance of the greater part of the preventable sickness which now afflicts so many thousands in the country would amount to many millions more. Thus, in time of peace, the health, wealth and life of the nation are vastly increased. In time of war, should such dire necessity ever arise, the power of attack or resistance is thereby multiplied many fold. For, not battle, but disease, induced by physical weakness and ignorance, is the source of greatest mortality to armies. Other things being equal, therefore, that nation is most invincible which puts into the field the wisest and healthiest troops. Every

consideration, then, of individual and social welfare, of State and National progress and development, demands the closest attention to this most vital matter of education.

It remains to consider briefly the objections to this scheme, the difficulties to be overcome in its application, and some plans for a beginning, at least in the way of the introduction of these subjects to the schools of the State.

The most serious objection to the adoption of the plan, at present, lies in its impracticability. And for this three causes may be urged: First, to make the study effective it should be compulsory in all grades of schools. By the school law of New Jersey, as it stands at present, the course of study is determined by the Board of Trustees of each school district for itself. In cities this office is performed by a Board of Education; in the higher institutions by the faculty. Now it may safely be said that except, perhaps, in the case of the latter class, these boards not only have no interest in, nor appreciation of the subject, but no knowledge to guide them in a wise adoption of what would be judicious. Evidently, therefore, it would be folly to expect at once such enlightenment as would be necessary to bring about perfect unanimity of feeling and action in this matter. So, too, there is no public sentiment behind them urging them on to give the matter serious consideration, for the public are more densely ignorant than they.

Again, even if we suppose the boards by some magical transformation to have decided upon this change, the great majority of the teachers of the State are entirely unfitted to carry it out, having given, in nine cases out of ten, absolutely no preparatory study to the subject.

Lastly, were the teachers ready, it may be said the schools have no apparatus, of books, diagrams, charts and models, wherewith to conduct such classes properly and make the study effective.

In addition to the grave charge of impracticability it may be said that errors are liable to be taught in a subject so changeful and one so progressive that what might have been considered knowledge a few years ago has now been outgrown.

Others would urge that such instruction is unnecessary, it being only needful, in order to live aright, to follow the dictates of common sense and nature.

Still others would say the scheme is fanciful, and would ask, where

it has been tried in some portions of this country and in England and Scotland, Has it realized the expectations of its friends and advocates?

In answer to these objections, briefly, and in reverse order, it may be said that nowhere has the experiment been tried, either fully, as here outlined, or for a sufficient length of time to test its capabilities. In Massachusetts and in the English schools it is optional rather than compulsory, and in very few is it pursued with completeness, accompanied by physical exercises for the full development of the body. Where this has been done its results have been most gratifying, as may be seen by the testimony of Dr. Routh and Mr. Maclaren, of England. It may safely be said that where even an approach to thoroughness has been reached in this direction its advocates have no wish to abandon it, but rather enthusiastically ask for more time and attention to its pursuit.

As to the all-sufficiency of nature and common sense as guides, a moment's reflection will show that we are living in a highly artificial state of civilization which has created new wants, desires and means of gratification, and at the same time dangers so insidious, secret and complicated, that one who should trust his unaided powers to carry him through life would almost certainly meet an untimely fate.

Respecting the liability to the teaching of error, it may safely be said that the present state of our knowledge in these sciences insures the inculcation of a hundred well-known, reliable, far-reaching and valuable truths, to one insignificant and trifling possible error. Even where there is a possibility of mistake the best scientists in these particulars do not state as fact what is merely probable or possible, but leave to future investigation to determine accurately what is now merely conjectured.

In reference to the supply of materials, books, charts, models and the like, it is safe to say that all the essentials may be purchased for each school district at a very trifling expense, and these, with the aid of good text-books, many of which are published both in this country and in England, may be made very instructive and valuable if only the living teacher be apt and filled with enthusiasm in and for the work.

And here is the most serious objection to the speedy introduction and prosecution of these studies in our schools—the teachers are themselves untaught. Very few, comparatively, have even studied these matters in their own school courses; still fewer have pursued them in mature life with reference to teaching them to others. How are

these defects to be remedied? Let the State Board of Health appeal at once to the State Board of Education, under whose care is placed the State Normal School, urging that no teacher be permitted hereafter to go out from that institution unless thoroughly qualified to teach, in the best manner, the subjects under consideration. To be thus qualified they must be taught by the most approved methods, and it would need but a few lessons on the part of a professor of physiology to show both how this should be done and how full of living and absorbing interest is everything pertaining to these subjects when once properly handled. The State Board of Education might also be urged to use its influence for the passage of a law making some instruction in these subjects compulsory, if not at once, at least after the lapse of a few years, so as to allow time for the necessary changes to secure its enforcement.

Meantime there are about 3000 teachers in the State to be fitted for this work.

By law each county in the State must hold a Teachers' Institute, at least annually, for mutual conference, assistance and instruction; make the attendance compulsory; urge upon the State Superintendent of Public Schools, and upon the county superintendents, the imperative necessity of likewise attending these gatherings. Ask them to call in at every such meeting the assistance of physicians or sanitarians who have given special attention to these matters, in order to arouse enthusiasm in the teachers, to inform them of the best text-books, charts, diagrams and models for their own guidance, and to give them illustrative examples of how these subjects may be taught.

In large cities having local boards of education, superintendents and normal schools, the progress may be more rapid in preparation for this work, as the educational machinery is more manageable, the facilities are greater, and the appreciation of its value more likely to exist.

At the same time, however, that a united and persevering effort is made with the teachers, the general public must not be neglected. Appeals should be made to local boards of trustees, setting forth clearly the importance of these subjects, and urging them to require a study of them on the part of all teachers in their employ. Local boards of health, of which there are now over 200 in this State, with the aid and co-operation of the State Sanitary Association, could do no more useful work than to enlighten the people of their respective neighborhoods by means of addresses, lectures and social conferences

in respect to the value of this kind of knowledge, and the importance to them and their children of getting it through the schools, where it can be most successfully taught.

The press, always anxious to be foremost in every good work, would be glad to report these meetings, to endorse their action, and to support the scheme by earnest advocacy of all rational measures for carrying it out. Thus a much larger audience would be reached than could possibly be gathered at any one assembly.

The pulpit of all denominations would be found to encourage it, likewise, and the injunction, "Glorify God in your bodies which are His," might form the theme of many a practical discourse.

In these ways, then, the general public is aroused; boards of trustees are set to thinking and planning for a better teaching in the schools under their charge; State and county superintendents and the State Board of Education are made alive to the overwhelming importance of these as compared with any other possible branches of learning; teachers are quickened into active prosecution of a new study or earnest brushing-up of what has grown rusty from disuse; the demand for improved means of instruction creates a supply of the needed apparatus, in greater abundance and of less expensive construction; and all interested in the great matters of the health, wealth, happiness, education and moral condition of the people, are stimulated to new activity for the attainment of these most desirable ends.

Of course it would be folly to expect that all, or even a large share, of these results could be secured at once. No doubt many years of persevering effort, of discouragement, of trial and failure, must pass before even a tithe of them can be realized. A beginning may be made, however, and one improvement after another suggested and carried into effect as opportunity offers.

What is chiefly needed is some energetic man, or body of men, whose enthusiasm is unbounded, whose love for the work is unselfish, whose knowledge is limited only by the present state of these sciences, to press these matters seriously, earnestly, vigorously and continuously upon the attention of all the parties concerned—educational officers, teachers and the general public. Twenty years of faithful application of the plan here sketched would do more, we firmly believe, for the welfare and progress of our State in all that pertains to right living, than it is possible now to estimate.

TYPHUS FEVER AT CAMDEN COUNTY ALMSHOUSE.

E. M. HUNT, M. D.

After the report of the Board for 1880 had gone to press, an outbreak of fever occurred in the Camden county almshouse. A memorandum relating thereto (pp. 181–183) was added to the report, but the fever and incidents connected therewith demand a more extended notice.

Typhus fever is a disease which has seldom become largely epidemic in the United States, and is regarded as belonging chiefly to the ill-housed and famished poor of older countries. The epidemics in Ireland and at Liverpool after the famine of 1848 illustrate how it is originated and fostered by crowding and destitution. It has, however, so much a specificity of its own, that, like cholera, it has not been regarded as occurring here save by importation. If this were its only source, our State would need to be on guard against it. At one time Perth Amboy suffered by direct importation. Proximity to ports such as those of New York and Philadelphia exposes us to all diseases consequent upon immigration. Now, with increasing numbers of arrival, persons soon find their way from New York and Philadelphia to our country roads and to our almshouses, or, as laborers, become inmates of our dwellings. Besides this, the prevalence of typhus fever last year in Philadelphia has not been satisfactorily traced to foreign origin. Prof. Janeway, in his paper on "Typhus Fever in New York," as read before the Academy of Medicine, May 19th, 1881, seemed to entertain the idea of its spontaneous development there amid cheap lodging-houses, foul air, over-crowding and filth. Dr. J. C. Peters stated that of 318 cases he had noted, none had been traced to importation. While for the last ten years the disease has shown itself rarely in this country, cases occurred at several points last year. There were 490 cases in all in New York

city, and 121 died. The contagion is one of the most decided, persistent and fatal with which we have to deal. Our crowded populations are beginning to be quite comparable in their conditions, and so will be in their diseases, with those of other countries. Both because of our State location, of our proximity to sea-ports and our late experiences, we have occasion to study any epidemic of this disease, and notably the one now under consideration.

Fevers of a remittent character had been so prevalent at the almshouse in the summer and fall of 1880, that the case of Brown, who was brought there sick and delirious, November 24th, only seemed to vary therefrom in presenting more of a typhoid character. As he became convalescent about two weeks after admission, it was not until the middle of January that his relation to the prevalent fever came to be fully appreciated. It was then noted that not only did his two room-mates become affected with a similar form of fever, but that it next invaded a room directly opposite, and affected persons in adjoining rooms until each room on that floor had one or more cases. These, as the returns show, were not regarded as distinctively typhus fever. It was especially unfortunate that owing to an accident to the heating apparatus the already over-crowded part of the old almshouse was made to hold the entire crowd of inmates. The fact is thus stated by one of the attending physicians:

"The steward was obliged to transfer, by reason of insufficient bed-clothing, those who slept in the large and commodious sleeping-rooms of the new building, to the old building, which already contained its full quota. Necessity compelled the packing together of old, middle-aged and young. Bedsteads occupied all available space, and straw beds were improvised on the floor. A large coal stove was in the center of one of the large rooms, with 35 persons sleeping in the room and scarcely any ventilation. Not more than 15 persons should have slept in the room. All windows were closed down to protect those sleeping near them. The stove was kept at red heat, consuming all the oxygen; and the crowded inmates, inspiring the polluted and confined air, made good subjects for the rapid development of the fever poison already imported."

The average number in all had been about 180, but at this time 275 were crowded into the old apartments.

January 12th, the following letter was received from Drs. McCullough and Branin, the attending physicians of the almshouse and the county asylum, which adjoins it:

BLACKWOODTOWN, N. J., January 10th, 1880.

E. M. Hunt, M. D., State Board of Health, Metuchen, N. J.:

DEAR SIR—About a fortnight since there occurred at the Camden county almshouse a serious and malignant epidemic, marked with the characteristics of typhoid, typhus and malarial fever. We have had, since its inception, forty-seven cases and twelve deaths. The causes which have prevailed to produce this unprecedented number of cases, and the consequent mortality, remain, to a certainty, obscure.

The medical officers have made the most strenuous endeavors to hold it within proper limits. Our sewerage system has been carefully examined and found faultless. The water tank has been drained and all sediment removed, the water not supposed to contain any organic matter; sleeping apartments cleaned, whitewashed and thoroughly disinfected. All our cases were last week removed into our newly completed hospital, with its improved ventilation and steam heat. Since the 6th instant, no new cases have developed, and our patients seem, generally, to present a more favorable aspect and convalescing, with the exception of four or five, who will probably die.

The Philadelphia newspapers have for several days contained lengthy articles reflecting on the management of the institution, and assign improper ventilation, the crowding of too many inmates into narrow, contracted apartments, and abundance of filth, as the cause of the fever poison.

Our almshouse committee, on the 4th instant, authorized the physicians of the institution to make a searching investigation, to announce the fact to the State Board of Health, if, in our judgment, we deem it necessary.

We therefore feel ourselves unwilling to assume the responsibility of deciding positively in reference to the causes which have induced this prevalent fever, and invite you to come down personally and assist in our investigation, when all the facts will be made known to you, with history and treatment of all the cases. * * *

I immediately communicated with the Board, and arranged for a visit January 17th.

The physicians, the steward, and Mr. L. De Rousse, on the part of the freeholders, gave every facility and afforded valuable assistance in the inquiry.

The medical history of the cases, and an examination of some of them, left no doubt in my own mind that the fever was distinctly typhus. As there had been some cases of a pernicious remittent type, it seemed wise to have, in case of other deaths, expert post mortem examinations made. The result left no doubt as to the distinctly typhus character of the fever.

I sought the history of the first ten or twelve cases that had occurred. The first patient was living and was able to give an intelligent account of himself immediately previous to his attack. He had been working during the summer at Ellisburg. About the 4th or 5th of November he went to Philadelphia, where he remained about a week, with very indifferent self-care. He lodged in two

lodging-houses which he describes as of the lowest kind. The crowded rooms were occupied by about twenty others, and a few days after his return home, he became ill, and was brought in a semi-unconscious condition to the almshouse, November 24th, and placed in a small room, about 12x12, with three persons in it. On December 6th, one of his room-mates was taken sick with the same fever, and the other soon after. In the next room on the left, occupied by two persons, both were taken sick. Cases soon followed in the two rooms on the opposite side, across an eight-feet hall. The first ten or twelve cases were just in this section. In the two adjacent rooms, and in the three opposite, very few escaped.

As the first cases were not of so uniformly severe a type as the later ones, and it became important to inquire into the conditions which had promoted the spread or intensified the severity of the disease, the water supply was carefully examined. It was found that this was derived from surface springs, which, although not valuable sources where the ground is rich in organic matter, or where there is much decaying woody matter, are often resorted to without apparent injury.

In the present instance this supply was unusually good. The water, after being conducted to the building, was stored in tanks, one of which had an overflow into the sewer pipe, which might thus serve as a conveyance of sewer gas to the water in the tank. Careful chemical examination of the water by Prof. H. B. Cornwall, of Princeton, did not seem to show sufficient probability of serious contamination from this source. An examination of the sewer system showed that chief reliance is placed on out-door methods. The ventilation of the sewer pipe was defective. Some errors in construction were noted and corrected, but only as a part of the general improvement, rather than as having any causative relation to the outbreak.

The general keeping of the house also showed much care and great effort to secure cleanliness amid embarrassment. The one intense and apparent evil was that of over-crowding. We found seventy men in two adjacent sitting-rooms, not adapted for half that number. At the very time one was stretched out upon a table and examination showed the characteristic spots of typhus fever. In the bed-rooms the evil, as expressed by Dr. Branin, was still more marked. Another, a careful and candid observer in the vicinity, wrote thus:

"With regard to the disease that has been so fatal, I think that while perhaps it did not originate in the institution, some of the conditions were favorable to its becoming an epidemic. Many of the men by exposure and improper and scanty living before they

came there were very much enfeebled, and in right condition to take any disease. Most of them were necessarily filthy in their habits. There ought to be large bath-rooms (warmed) where every tramp should be required to go and wash himself when he enters the building. The clothes of most of these men were saturated with filth, and were of themselves disease-breeding. Having no knowledge of sanitary laws, they would shut up their rooms in the night and thus have them filled with a poisoned and poisonous atmosphere. The bursting of the boiler, preventing the heating of the new part of the building, and the huddling of such large numbers of men into small rooms, was a very important factor in the increase and virulence of the disease."

These men, whether sick or well, were received in a most informal manner for a longer or shorter period, and packed together without any of that accurate sanitary and police discipline which such an institution requires. While it may be that the want of method here was only by circumstances made more conspicuous than similar or worse conditions in other almshouses of the State, the example should suffice for a warning to all the counties of the State, through the present century at least.

The crowding of these inmates together and the increase made by an accident to the furnace could not justify so palpable a breach of sanitary propriety. All the less because before this was done eight cases of the fever had occurred. It is not surprising that after the next week 31 new cases occurred, and that typhus fever declared itself in a more malignant form. But for this increased over-crowding it is probable that the disease would have been a typhus of a much milder grade. While the course worked out and agreed upon with the attending physicians was clearly understood and approved, yet for causes not here necessary to enumerate there was delay in execution and much imperfection in the isolation and quarantine attempted. Even this was attended with some good results. It was not, however, until another visit of a committee of this Board, consisting of Prof. Brackett, Dr. Gauntt and myself, on February 3d, that we succeeded in securing anything like a satisfactory system of discipline.

The letter of Dr. McCullough, a few days subsequently, now seems all the more heroic, because he fell a sacrifice to his devotion. He says:

"Since your visit to our almshouse we have exercised our best efforts to carry into effect every instruction we received, and put in force every suggestion that would thoroughly disinfect and isolate our classes of inmates. To perform this with any degree of success has required much of our time and constant vigilance to prevent a violation of established rules. Last week I gave my personal attention to executive duties, whilst my colleague confined himself to medical treatment of patients. We had no responsible head. Our steward was deceased, and in obedience to your request and by order of our committee, I assumed full command. In this vocation I felt

myself successful, for I instituted reforms which had not before been heard of since the institution was built. I organized a scrubbing and whitewash force, who were kept under my surveillance until all work of this kind was performed to my satisfaction. * * *

"We have now a first-class male and female nurse, who have, with our co-operation, aid and counsel, established hospital discipline and materially improved the condition of our patients. Male and female departments have been well provided with necessary supplies and assistant nurses, who are receiving a good training under experienced chiefs. We have had an average admission daily of one case. Ninety cases since first outbreak. Twenty-five deaths. The females continue to have the fever of that mild type; only three cases of severity; one death (colored), and one case with coma-vigil on the eighteenth day." * * *

The disinfection, isolation and discipline which were instituted had a marked effect in diminishing the severity of the disease. In the female department the officers were able to anticipate the disease, and although its occurrence was not prevented, the effect was apparent in the greater mildness of most of the cases.

The record of cases, so far as we have them, is as follows:

To December 25th, 8 cases.

To January 10th, 1881, 47 cases; 12 deaths.

Up to February 16th, 90 cases; 25 deaths.

At date of February 16th, there were in hospital: Male patients (white), 20; colored, 4; assistants, 5. Female (white), 7; colored, 2; assistants, 3.

The report February 26th is as follows:

Total number treated to this date—male, 80; female, 13.

Of these, 29 had died, 33 had been transferred, 4 were convalescent assistants, and 27 remained in hospital.

About February 5th, by arrangement, one of the physicians had taken the sanitary administration directly and personally in charge.

The last letter of Dr. McCullough, under date of February 28th, is as follows:

CAMDEN COUNTY ALMSHOUSE, February 28th, 1881.

Dr. E. M. Hunt, Metuchen, N. J.:

DEAR SIR—Yours of 23d instant received, and contents fully satisfactory to myself and colleague. Enclosed please find report for 28th inst. We have on hand, in hospital, only one serious case, the remainder making good recoveries, and it is hoped we have experienced the worst, and the disease will soon subside. We have had no deaths for a week, and no new cases since 23d inst. Our inmates are eloping, which affords better opportunities for distribution and cleanliness.

With kind regards, &c., yours truly, J. W. MCCULLOUGH.

The improvement made in sanitary arrangements, with the earnest co-operation of both of the physicians, continued to give favorable

results to the poor sufferers; so that the census of March 15th showed only 12 males and 4 females in hospital.

March 21st. There were but 9 cases in hospital, with but 2 deaths since last report.

The report of March 26th showed only two cases of typhus fever remaining.

The report of April 4th says: "No new cases of typhus fever have occurred since the 22d of last month," although up to May 7th two or three convalescents were under care.

This Board cannot speak too highly of the assiduous co-operation of both of the physicians, and of the earnest and assiduous work of the surviving one after the death of his colleague.

Weekly reports and frequent correspondence were continued until about June 1st. Hospital and almshouse disinfection was considered in all its details, and applied to a fuller extent than has ever before been secured in the State. While the typhus poison is one of the most persistent, it is hoped that the old building, as well as the new, is entirely rid from any particles which might revive the disease. The following note of May 16th, 1881, describes the mode of conducting the final restoration of the institution:

CAMDEN COUNTY ALMSHOUSE, May 16th, 1881.

H. E. Branin, M. D., Physician in Charge Camden County Almshouse:

SIR—In compliance with your request I have the pleasure to lay before you the *modus operandi* we have been pursuing in cleansing, disinfecting and renovating the house.

After having the walls, floors, &c., well scraped, the ceilings and walls were repeatedly washed, by means of a hand-pump, with the following preparation: To each bucket of water was added a spoonful of carbolic acid (crystals), one ounce of sulphate of zinc and about a handful chloride of lime. The floors were next thoroughly soaked for 48 hours with the same preparation, when finally the rooms were whitewashed, each room receiving three or four coats of whitewash. The whitewash was prepared in small quantities. The lime was slackened to a proper consistency in each bucket separate, when to each bucket of fresh-slackened lime one pint of a strong solution of blue vitriol and a handful of salt were added.

After the whitewashing, each room and entry was daily disinfected by means of a steam-atomizer—a strong solution of carbolic acid being used—for two weeks.

While we were proceeding with this work in the old building it was unoccupied, the inmates having been previously removed to the new building.

It is the intention to allow the old building to remain empty for some time, and continue the daily use of the steam-atomizer.

We are engaged at present in disinfecting, and cleaning the steward's apartments, also situated in the old building, after which we shall put the new building through the same process.

Very respectfully,

FRED JOHNSON.

Although the county asylum is in the same inclosure and under the same medical management, the fever did not spread to it. While the mortality was large, and the possibilities of the extension of the disease in the vicinity were at one time imminent, we feel that its limitation and removal give new evidence of the effectiveness of sanitary measures applied in the midst of a pest, as well as a great warning against that sort of executive looseness and that imperfect provision of accommodation which leads to the crowding of such masses into too narrow quarters. It so happened that before this outbreak the attention of our State Board had been drawn to the insanitary condition of many of our county and town buildings. An outline as to some of the same appeared in our last report, and reveals a state of affairs that shows the need of more careful sanitary oversight of the dependent classes in many of our public institutions. Taking the Camden almshouse as an illustration of what may readily occur in other similar county or town-houses, we may well consider whether forethought is not better than afterthought; whether prevention is not better than stir and treatment amid the perils and disasters of disease. Were it a mere question of financial policy or economy, the thousands of dollars that such an epidemic costs the locality ought to warn others against similar risks. The demoralization which is caused by the methods of crowding, and by the imperfect care as to details in many of these houses, is worthy of State inquiry, as it affects the social condition of the people. If inmates are allowed to wear soiled clothing; if they are indulged in filthy habits and allowed to remain unwashed; if they spend their days in crowded rooms in which the air is suffocating, and their nights in bed-rooms in which air-space is not thought of, the results are not only personal, but involve the interests of the entire county and of the State. More than once has it occurred that the Legislature has found it necessary to investigate local abuses, and thus to assert its common protection of the citizen, even in those matters which generally fall only under the jurisdiction of local authorities.

As in several other cases in which the Board has been called upon to aid, our co-operation with the local authorities has been cordial and complete, and we have been able to secure the application of methods tending to permanent relief. We only ask that the lessons of Jamesburg and Camden, of Princeton and Bound Brook, may not be forgotten, and that we may not need other outbreaks to remind us that penalties for the breach of physical laws involve social, civic and

state interests to such a degree as to imperil the welfare of our common citizenship. The remedy is in a general diffusion of sanitary knowledge, a recognition of the evils resulting from neglect, and that exactness of administration which will prevent such sickness and death, instead of illustrate its vigor and energy only amid the evils which neglect and delay have caused.

November 2d, 1881, the Secretary, on behalf of the Board, made a careful examination into all the details of reconstruction and renovation. The entire building has been cleansed, no proper expense has been spared, and the building and its appointments are now such as are unequaled in most of the counties. There is no longer need of over-crowding. Better than all, a thorough discipline has been established, and the whole institution will be run on the basis of the best almshouse management. The county owes a debt of gratitude to some of its most active and efficient freeholders. Would that some other counties whose almshouses are fitted to perpetuate pauperism and to manufacture disease, might make similar improvements, both in construction and regulation, and not wait for the warnings of an epidemic in order to secure proper accommodations and management. The fact that Camden city was compelled to quarantine against the fever, and that so many of the officers and attendants contracted the disease and died, shows how much our common welfare is involved in the proper care of the indigent. It is all the more sad because the loss of Dr. McCullough was not only a loss to his profession, but to the State; a loss incurred not so much in the discharge of his medical service as in the fact that he stationed himself at the post of danger, and, by the necessities of sanitary police, contracted the disease.

FACTS AS TO THE ABATEMENT OF THE BOUND BROOK MALARIA.

BY C. M. FIELD, M. D.

CHARACTER OF THE STREAMS AND OBSTRUCTIONS.

The pond, known as the mill pond, is formed by Ambrose brook, which flows through Piscataway township, Middlesex county, and, uniting with Green brook, which flows along the base of mountains north of Bound Brook, forms the stream, Bound brook, which empties into the Raritan river just east of town of Bound Brook. Years ago a dam was placed across Bound brook. Then the Central Railroad of New Jersey, and finally the Lehigh Valley railroad, placed their road-beds in the line of the dam, and so left but a small way for the passage of water during heavy rains, thus damming it up and allowing the deposits of alluvium, and leaves and wood, and such debris as was carried from the regions above, to cause the pond to fill to such an extent that, in order to get water for mill power, the Lehigh Valley railroad raised the dam, at the mouth of Bound brook, from one foot to eighteen inches. This backed the water over some sixty to seventy-five acres of land, and this extra obstruction, added to the sluggish flow of the streams, made thus a large morass, from sixty to seventy-five acres, and was filled with dying, dead and decaying vegetation, on which the water stood to the depth of only a few inches. The vegetation and debris had destroyed the channels of the streams, so that the water, instead of flowing, for most part percolated through this mass of vegetation. In addition to this, the flow of water was of such limited amount that the owners of the water-power, in order to use it, dammed up the water during the night, and then, in using it during the day-time, would draw off the water and leave some sixty acres of this morass of festering vegetation and slimy mud exposed to the hot rays of the sun. The result was that a most disagreeable odor

arose and was borne all over the neighborhood, and throughout the town of Bound Brook and vicinity. The odor, that of decaying vegetation, damp, offensive and penetrating, was a concentrated extract of that with which most are familiar, as arising from vegetation situated under similar circumstances.

ACTUAL SICKNESS.

The people of Bound Brook and vicinity began to suffer from the group of symptoms generally classed under the head of malaria, intermittent and remittent fevers and fearful neuralgia of different regions of body, and this continued, under the use of quinine and the usual anti-periodic treatment and remedies, until, out of the whole population of Bound Brook, there was but *one* person known not to have suffered, and decidedly so, from malaria in some form. Let it be remembered that Bound Brook shows itself to have been a healthy place by its death-rate, and the remarkable longevity and robustness of its old families. Yet, in spite of all care and persistent treatment, it was impossible for the inhabitants to remain in the town or vicinity and be well. The population is between 1,000 and 1,300.

Such being the condition of the health of the place, the citizens, with the advice and assistance of the State Board of Health, and General Vielé, of New York, presented the following indictment, and the case came up for trial at Somerville, Somerset county, N. J., during the September term of 1880, Mr. R. V. Linaberry, Esq., now of Elizabeth, and John Shaw, Esq., of Finderne, having charge of the case.

The case was thoroughly sifted, many of the prominent physicians and sanitarians of the State being called to the stand, and the verdict was rendered against the pond. The judge's charge I am unable to send you, but the parties owning the pond were "ordered to abate the nuisance forthwith."

WHAT WAS DONE.

The Lehigh Valley railroad began by removing the dam and then cutting a ditch, wide and deep enough to carry off the water from the streams. This was made straight and the former winding and partial courses filled up. The citizens then employed men and thoroughly removed the deeper portions of the dam and drained the region of the former pond. The result of the drainage of pond, upon the land for-

merly occupied by it, has been perfectly satisfactory. It was "*limed,*" and this year used for pasturing cattle. The noxious odors have entirely disappeared, and the land, in place of being covered by a mass of stinking, decaying vegetation, is a fertile meadow. The result on the health of citizens I will mention later.

In addition to thorough draining of this region, the citizens formed a citizens' sanitary committee (a copy of which I enclose), which inspected all the premises of the town and compelled all persons to keep their property in a perfect sanitary condition. The following is their circular:

HEADQUARTERS CITIZENS' SANITARY COMMITTEE,
BOUND BROOK, N. J., ..., 188...

Mr....................................

DEAR SIR—At a public meeting, held in Bound Brook hall, November 23d, 1880, a committee of eight citizens were appointed to examine the sanitary condition of the town and vicinity, and the following resolution of instructions was unanimously adopted:

"*Resolved*, That the Citizens' Sanitary Committee be, and they are hereby, instructed to make a thorough sanitary inspection of the towns of Bound Brook, Bloomington and Middle Brook, and wherever nuisances are found to exist, the committee are requested to use all persuasive measures within their power to have the same abated forthwith. In case of neglect or refusal of any one to comply with reasonable recommendations, the committee are further instructed to lay the cases before the first Grand Jury that meets."

In accordance with the foregoing resolution, the Citizens' Sanitary Committee have made a careful examination of your premises, and would recommend that

....

If allowed to remain in its present condition through another season of hot weather, the committee believe that it will be very detrimental to the health of the town. Your early compliance with the foregoing recommendation is earnestly requested. The committee would also suggest that care be taken not to allow vegetable and other refuse matter to decay in and around your premises; by so doing you can remove a fruitful source of disease.

Yours, respectfully,

....,
....,
Citizens' Sanitary Committee.
...................................., *Secretary.*

The places known as the gravel-pits, situated at the west end of town, have been filled in and drained. This has just been completed, and will remove all troubles which arose from their condition.

PRESENT RESULTS.

As regards the result of the removal of nuisance, the present condition of our town must speak for itself. The year has been remark-

ably healthy in the town proper. The foul, noxious odors have entirely disappeared. Strangers from a distance have enjoyed good health here. I have not attended, *nor heard of* (and I have given due attention to 'the subject by inquiry), as many people suffering from intermittent and remittent fever during the whole year of 1881 as I *saw* during one month of 1880. Very few of the citizens living in the region of the former pond, have had any trouble at all. Those of whom I know had their trouble cured by a few small doses of quinine and cinchonidia. This is the same region, where all were ill last year, and continued so in spite of treatment, in the vicinity of the old pond. In this same region, during 1880, I saw for days as many as an average of 140 cases of malaria a day, *i. e.*, I saw daily, for months, an average of 140 cases in the same region, where this year the cases which I attended, or heard of, would not average a day more than two to five at the outside. The peculiar season must be taken into consideration, and the extreme prevalence of malaria throughout the United States, in forming any rational opinion of the probable result of removal of pond. Again, the people are beginning to know how to treat themselves for malaria, and by taking quinine and cinchonidia, etc., etc., avoid the full effects of the disease. How much this increased knowledge may account for in the restored health of the region, it is impossible to say. But that the removal of the morass and draining of the noxious region has been instrumental in abating the disease, a few facts in other localities would naturally lead one to conclude.

Following the course of the brooks, Ambrose and Green brook, wherever we found a morass, the people suffered, and badly so, from malaria. The same is true, following the course of the Raritan river on towards New Brunswick. Again, the gravel-pits were not in a sanitary condition until the present time. The people in the vicinity of these pits and ponds had the marsh fever universally and severely and continuously during the year. These people had the fever or malaria last year, and understand the use of quinine. They suffered in spite of increased knowledge, under the same general conditions and treatment which those who live in the region of the drained pond, but who this year escaped free. This certainly speaks for itself. The present condition is the evidence the case gives that malaria was manufactured *then and there.*

I have not had a case of typhoid fever in my practice during the past year, but one of diphtheria, and the town of Bound Brook is in a very healthy condition.

We append a copy of the indictment under which the case was tried:

INDICTMENT.

SOMERSET OYER AND TERMINER, September Term, 1880.

SOMERSET COUNTY, *ss.*—The grand inquest for the State of New Jersey, in and for the body of the county of Somerset, upon their oath present: that ...., late of the township of Bridgewater, in county of Somerset, and State of New Jersey, being seized and possessed of a certain tract of land, to wit, forty acres. and appurtenances, situate near and adjacent to the dwelling-houses of divers of the good citizens of the State, and being partly in township of Piscataway, in county of Middlesex, partly in township of Bridgewater, in county of Somerset, through which, on the boundary line between the said counties of Middlesex and Somerset, there ran, and still runs, an ancient and common stream or water-course, called Bound brook, did, on the 1st day of July, in the year of our Lord one thousand eight hundred and eighty, and from that day until the day of the taking of this inquisition, with force and arms, at the township of Bridgewater aforesaid, and within the jurisdiction of this court, willfully and knowingly, unlawfully and injuriously, keep and maintain, and permit and procure to be kept and maintained, a certain dam, that had been theretofore erected on the said tract of land across the channel of the said stream or water-course, by means of which the water flowing in the said stream or water-course was stopped, dammed up and flowed back, and still is stopped and dammed up and flowed back, in and upon the surface of large tracts of land, by means whereof the mud, soil, wood, leaves, brush, and the animal and vegetable substances, and other filth, collected and brought down the channel of said stream or water-course by the natural flowing of the water, then became and were, during all the time aforesaid, and still are, collected and accumulated in large quantities in the channel of said water-courses, and on the lands overflowed as aforesaid; and the said mud, soil, wood, leaves, brush, and the said animal and vegetable substances and other filth, so there collected and accumulated, became and were and still are very offensive, and the waters became and are corrupted, and said tracts of land overflowed became and are covered with noxious weeds and putrid vegetation, by means whereof divers nauseous, unwholesome and deleterious smells, stenches and vapors did arise, etc., and so that the air was, and still is, corrupted and infected, to the great damage and common nuisance, not only of all the inhabitants of the said township of Bridgewater, but of all other good citizens of this State thereby passing and repassing, dwelling, inhabiting, etc., and the said nuisance, so caused and maintained as aforesaid doth yet continue, contrary to the form of the statute in such case made and provided, against the peace of this State, the government and the dignity of the same; and the grand inquest aforesaid, upon their oath aforesaid, do further present: that said ...., being seized and possessed of a certain other mill-dam, with its appurtenances, situate near and adjacent to the dwelling-houses of divers of the citizens of this State, did, on the 1st day of July, in the year of our Lord one thousand eight hundred and eighty, and on divers other days and times between that day and the day of the taking of this inquisition, at the township of Bridgewater aforesaid, in the county aforesaid, and within the jurisdiction of this court, unlawfully and injuriously so use and occupy the said other mill-dam, with its appurtenances, as unlawfully and injuriously to cause and permit the waters of the stream obstructed by said dam and its appurtenances, to overflow,

by night a large tract of adjacent land, to wit, one hundred acres, lying above the dam and extending thereto, and to run off therefrom by day, by means whereof the said land so overflowed by night was exposed to the rays of the sun during a large part of each day, whereby miasma was generated in large quantities, which infected and corrupted the air, to the great damage and common nuisance, not only of all inhabitants of the said township of Bridgewater, but of all other good citizens of the State, contrary to the form of the statute in such case made and provided, against the peace of this State, the government and dignity of the same.

And the grand inquest aforesaid, upon their oath aforesaid, do further present: that said ...., being seized and possessed of a certain other mill-dam, with its appurtenances, also situate near and adjacent to the dwelling-houses of divers of the good citizens of this State, did, on the 1st day of July, in the year of our Lord one thousand eight hundred and eighty, and from that day until the day of the taking of this inquisition, at the township of Bridgewater aforesaid, in the county aforesaid, and within the jurisdiction of this court, unlawfully and injuriously use and occupy the said other mill-dam, with its appurtenances, as unlawfully and injuriously to cause and permit the waters of the mill-pond, formed and created by said other mill-dam and its appurtenances, to overflow the adjacent land, as well of others as of his own, by means whereof the land so overflowed was, and still is, rendered and kept marshy, and filled and covered with noxious weeds and putrid vegetation, whereby the air became and still is infected and corrupted, to the great damage and common nuisance, not only of all the inhabitants of the said township of Bridgewater, but of all other good citizens of this State; and the said nuisance so caused as aforesaid doth yet continue, contrary to the form of the statute in such case made and provided, against the peace of this State, the government and the dignity of the same.

SOME CITATIONS FROM THE LAW RELATING TO NUISANCES.

BY E. S. ATWATER, COUNSELOR AT LAW.

The principle upon which the law protects against nuisances is, that one man has no right to use his property in such manner as to injure another. The legal maxim is, "*Sic utere tuo ut alienum non lædas.*" Public nuisances are defined to be such as "result from the violation of public right, and producing no special injury to one more than another of the people—may be said to have a common effect, and to produce a common damage."

The courts take cognizance of nuisances affecting the public health. Indeed, it has been held that interference with the physical comfort of the people is a sufficient ground on which to invoke the action of the court.

In Wood on Nuisances, § 76, it is said: "In order to render a person liable for a public nuisance by carrying on a noxious trade or maintaining anything that produces noxious smells, it is not necessary that the smells should be injurious to health. It is sufficient if they are of such an offensive character as to be materially offensive to the senses, and such as impair the physical comfort of those who come within their sphere."

In the case of Attorney General *vs.* Steward & Taylor, reported in 5 C. E. Green, page 417, &c., Chancellor Zabriskie said: "Any trade or business, however lawful, which, from the place or manner in which it is carried on, materially injures the property of others, or affects their health, or renders the enjoyment of life physically uncomfortable, is a nuisance which it is the duty of this court to restrain."

The same Chancellor, in the case of Ross *vs.* Butler, 4 C. E. Green, page 298, says: "The law takes care that lawful and useful business shall not be put a stop to on account of every trifling or imaginary annoyance, such as may offend the taste or disturb the nerves of a

fastidious or over-refined person. But, on the other hand, it does not allow any one, whatever his circumstances or condition may be, to be driven from his home, or to be compelled to live in positive discomfort, although caused by a lawful and useful business carried on in his vicinity."

WHO ARE RESPONSIBLE FOR MAINTAINING A NUISANCE.

Not alone is the person who originates a nuisance liable therefor, but also he who continues it or who suffers it to remain on premises in his occupation. In this State it has been held that if the nuisance is simply continued, there must be notice to abate before a liability for damages will be incurred. See the case of Morris Canal and Banking Co. *vs.* Ryerson, 3 Dutcher's Reports, p. 468, which is a leading case. In Addison on Torts the principle is laid down that "a landlord of premises on which a nuisance exists is responsible if the nuisance existed at the time he let them or relet them, or continued the tenancy after he had the power of determining it."

The same author also says: "The action may be brought against all the persons doing or ordering the doing of the wrongful act, as well as against the occupier of the land on which the nuisance exists; but instead of bringing his action against all jointly, the plaintiff may, as we have seen, sue one or more of them, at his election."

In Wood on Nuisances, § 31, the principle is laid down: "That it is not necessary, in order to charge a person with criminal liability for a nuisance, that he should commit the particular act that creates the nuisance; it is enough if he contributes thereto by his act, either directly or remotely."

OF NUISANCES AFFECTING THE AIR AND WATER.

The right of the public to have a pure atmosphere and to have its water supply kept free from contaminating and unwholesome substances is asserted and protected by the law. Quotations from some of the authorities on these subjects are submitted: "The corruption of the atmosphere by the exercise of any trade, or by any use of property that impregnates it with noisome stenches, has ever been regarded as among the worst class of nuisances, and the books are full of cases in which any use of property producing these results has been regarded as noxious and a nuisance, whether arising from the exercise of a trade or business, or from the ordinary or even necessary uses of property.

As has been before observed, the right to have the air float over one's premises, free from all unnatural or artificial impurities, is a right as absolute as the right to the soil itself." Wood on Nuisances, § 494.

From the same volume, § 487, we quote: "The collection of water in artificial ponds or trenches, or the setting back of water by means of dams or other artificial devices, whereby the water becomes stagnant and emits unpleasant odors, or unwholesome or injurious gases, is a great nuisance, and equally as actionable or indictable as are furnaces for the smelting of lead, copper or other substances that send out destructive or injurious vapors."

"A mill-dam becomes a nuisance when it obstructs the water to such an extent that it overflows its banks and the surrounding country, and stagnates and becomes dead in pools, whereby the air along the highways and around the dwellings is infected with noxious and unwholesome vapors, and the health of the adjoining country is sensibly impaired. Nor is it a defence to such a nuisance to say that the dam was built long before any one lived on the margin of the stream, or there were any settlements about it."—Archbold's Crim. Practice and Pleadings, Vol. II., p. 1762.

In the case of Holsman *vs.* Boiling Springs Bleaching Co., reported in 1 McCarter, p. 342, Chancellor Green, said: "Every owner of land through which a stream of water flows, is entitled to the use and enjoyment of the water, and to have the same flow in its natural and accustomed course without obstruction, diversion or corruption. The right extends to the *quality*, as well as to the quantities of the water. If, therefore, an adjoining proprietor corrupts the water, an action upon the case lies for the injury."

"The right of the riparian owner, says Chancellor Kent, to the use and enjoyment of a stream of water in its natural state, is as sacred as the right to the soil itself. 2 Johns. Chancery Reports 166. A disturbance or deprivation of that right is an irreparable injury, for which an injunction will issue. If the deprivation of the use of the water by diversion constitutes such an irreparable injury as will be restrained by injunction, the deprivation of its use by so corrupting it as to render it unfit for use, is an equally irreparable injury entitling the party injured to the like preventive remedy." "Where the nuisance operates to destroy health or to diminish the comfort of a dwelling, an action at law furnishes no adequate remedy, and the party injured is entitled to remedy by injunction."

"It is clearly the duty of riparian proprietors upon a water-course

to refrain from erecting upon its banks any works which render the water unwholesome or offensive."—Angell on Water Courses, § 136.

"The right of a riparian owner to have the water of a stream come to him in its natural purity, is as well recognized as the right to have it flow to his land in its usual flow and volume. But in reference to this, as with the air, it is not every interference that imparts impurities thereto that is actionable, but only such as imparts to the water such impurities as substantially impair its value for the ordinary purposes of life, and render it measurably unfit for domestic purposes, or such as cause unwholesome or offensive vapors or odors to arise from the water, and thus impair the comfortable or beneficial enjoyment of property in its vicinity, or such as, while producing no actually sensible effect upon the water, are yet of a character calculated to disgust the senses, such as the deposit of the carcasses of dead animals therein, or the erection of privies over a stream, or any other use calculated to produce nausea or disgust in those using the water for the ordinary purposes of life, or such as impair its value for manufacturing purposes."

A PUBLIC NUISANCE CANNOT BE VALIDATED.

The authorities are ample to show that no right is acquired to maintain a public nuisance from the fact that it has been in existence a long time.

"No length of time legitimates a nuisance."—Wharton's Criminal Law, § 1415.

"There is no such thing as a prescriptive right or any other right to maintain a public nuisance. Thus, if the damming of water, though in accordance with a prescriptive right, creates or causes such annoyance as seriously to interfere with the comfortable enjoyment of property, or has a direct tendency to create sickness in the immediate neighborhood, it constitutes a nuisance to which a claim for prescription is no defence."—Wait's Actions and Defences, Vol. IV., p. 782.

"There can be no prescription for a public nuisance of any kind or description."—Wood on Nuisances, p. 743.

"Neither is it a defence in any measure, that the business is a useful one, that it is necessary, or that in its products and operations it is a public benefit and contributes largely to the enhancement of the wealth, prosperity and commercial importance of the community; for, if it is really a nuisance or operates as such upon the public, no

measure of necessity, usefulness or public benefit will protect it from the unflinching condemnation of the law."—Wood on Nuisances, p. 28.

It is to be remarked, however, that courts will not needlessly interfere with a business of the kind referred to in the last quotation. A case of nuisance must be clearly made out, and even then, before finally restraining the carrying on of a business, a court of equity will give the parties concerned an opportunity to see whether some other method cannot be devised by which the business can be so carried on as not to be a nuisance. This principle was applied in this State, in the case of Cleveland *vs.* Citizens' Gas Light Co., reported in 5 C. E. Green, p. 201, &c. That there are other nuisances in the immediate vicinity of the nuisance complained of, is not in general a defence to proceedings had for its removal. In Wood on Nuisances, § 491, it is said: "The mere fact that other nuisances exist in the locality, that produce similar results, is no defence, if the nuisance complained of adds to the nuisance already existing to such an extent that the injury complained of is measurably traceable thereto. It is not necessary that all the injury should be the result of the nuisance sought to be charged; if it is of such a character and produces such results that, standing alone, it would be a nuisance to the plaintiff, the fact that it is the *principal* though not the sole agent producing the injury, is sufficient, at least, as evidence of the plaintiff's right."

In the case of Meigs *vs.* Lister, reported in 8 C. E. Green, p. 205, Chancellor Zabriskie said: "The position taken by counsel, that the complainants were entitled to no relief from this nuisance, because the locality was surrounded by other nuisances and dedicated to such purposes, has no foundation in law or in fact. If there were several nuisances of the like nature surrounding them, they must seek relief from each separately; they cannot be joined in one suit, nor need the suits proceed *pari passu.*"

REMEDIES.

The legal remedies for nuisances are concisely stated in Wood on Nuisances, § 815, as follows: "The remedies for nuisances may be divided into three classes: preventive, compensatory and by punishment. The preventive remedy is secured by two methods: by the intervention of a court of equity to prevent the erection or use of the thing complained of, and by the act of the party injured by an abate-

ment of the nuisance with a 'strong hand,' of his own motion. The compensatory remedy is by an action at law for a recovery of damages resulting from the nuisance, and the remedy by punishment is that sought on behalf of the public by indictment."

The following is an extract from the opinion of Vice Chancellor Dodd, of this State, in the case of Manhattan Manufacturing and Fertilizing Company *vs.* Van Keuren, reported in 8 C. E. Green, page 255, in regard to the abatement of nuisances: "At common law it was always the right of a citizen, without official authority, to abate a public nuisance, and without waiting to have it adjudged such by a legal tribunal. His right to do so depended upon the fact of its being a nuisance. If he assumed to act upon his own adjudication that it was, and such adjudication was afterwards shown to be wrong, he was liable, as a wrong-doer, for his error, and appropriate damages could be recovered against him. This common law right still exists in full force. Any citizen, acting either as an individual or as a public official under the orders of local or municipal authorities, whether such orders be or be not in pursuance of special legislation or chartered provisions, may abate what the common law deemed a public nuisance. In abating it property may be destroyed and the owner deprived of it without trial, without notice and without compensation. Such destruction for the public safety or health is not a taking of private property for public use without compensation or due process of law, in the sense of the Constitution. It is simply the prevention of its noxious and unlawful use, and depends upon the principles that every man must so use his property as not to injure his neighbor, and that the safety of the public is the paramount law. These principles are legal maxims or axioms essential to the existence of regulated society. Written constitutions presuppose them, are subordinate to them and cannot set them aside. They underlie and justify what is termed the *police power* of the State. By virtue of that power numerous and onerous restrictions and burdens are imposed upon persons and property, which, for other purposes or on other grounds, would be prohibited by the constitutional limitations sought to be applied in this suit."

That courts of equity have full power to restrain and prevent public nuisances it is unnecessary to argue. The books are full of cases illustrating the exercise of this power.

It may be added that, where the remedy by indictment is pursued, the result of a conviction is not merely punitive upon the offender.

"Regularly, a part of the judgment upon conviction for a nuisance is that the nuisance be abated."

In Stewart's Digest of the Decisions of the Courts of New Jersey, the cases decided in our courts on what are considered nuisances, their continuation and remedy, are fully digested, under the title of Nuisance, on page 848 *et seq.*

REPORT OF THE COUNCIL OF ANALYSTS.

I.—ADULTERATION OF FOOD, DRINK AND DRUGS.

BY PROF. ALBERT R. LEEDS, PH.D., MEMBER OF COUNCIL OF ANALYSTS.

In a previous report, which I prepared at the request of my colleagues of the N. J. State Board of Health, and which was published in the annual report of the State Board for 1879, I have given the results of an examination of many articles of food, and have no occasion, in this place, to modify the conclusions and recommendations therein made. Since that time, however, a very great amount of labor has been expended upon this subject by chemists in various parts of the country, and it appeared desirable, in repeating this work upon adulteration, to give a greater permanent value to the results by stating, in every case where practicable, the percentage composition of the substances analyzed. This necessitated a great amount of labor, and in many cases a critical study of the methods of analysis and of the practical value of the data so obtained. The space herein afforded is too short to discuss or state those methods, and I have attempted merely to give, in the most concise manner, the figures and results of analyses. The classification is according to Hassall's work on food adulteration, so far as it could be followed:

CLASS IV.—TEA.

NO.		TANNIN.	ASH.	REMARKS.
109	Black Tea......	17.97 per cent......	....	Stomata on the under surface visible. Pure.
84	Mixed Tea......	13.28 "	6.00 per cent........	Pure.
25	....	12.16 "	6.10 "	Pure.
34	Green Tea......	11.78 "	5.50 "	Pure.
66	Green Tea......	12.71 "	7.04 "	Pure.
30	Green Tea......	11.03 "	6.23 "	Pure.
91	....	13.28 "	5.80 "	Pure.
78	Mixed Tea......	9.17 "	6.10 "	Mixed with exhausted leaves.
96	Black Tea......	9.54 "	6.00 "	
125	Black Tea......	12.70 "	5.62 "	Pure.
116	Black Tea......	12.70 "	5.08 "	Some foreign leaves were found.
121	Mixed Tea......	....	....	....

It will be seen that most of the samples of tea were pure. The admixture of foreign leaves and the use of exhausted tea-leaves were the worst adulterations in the samples examined. The theine was determined in most of the samples, but as further study showed that the determinations were erroneous in consequence of the inaccurate methods at present followed, the figures obtained were omitted as being without scientific value, and misleading.

CLASS V.—COFFEE. (THE WHOLE BERRIES.)

NO.	SOURCE.	ASH.	REMARKS.
24	Albro Bro., 156 Bowery, N. Y..................................	4.13 per cent.	Pure.
35	163 Newark Avenue, Jersey City..............................	4.82 "	"
38	R. Domstedt, 288 Grove street, Jersey City.................	4.70 "	"
76	30½ Dank street, Newark..	4.06 "	"
92	119 Newark avenue, Jersey City..............................	4.31 "	"
138	Oetjen, 125 Newark street, Hoboken.........................	3.77 "	"
140	McCourt, 137 Newark street, Hoboken	4.18 "	"
144	Adam street, near First, Hoboken.............................	4.21 "	"
149	Därmann, 125 First street, Hoboken..........................	5.46 "	"
152	Hencken, Clinton street, Hoboken.............................	4.65 "	"
159	Henry Proche, Willow street, Hoboken.......................	3.76 "	"
165	Gidgon, 38 Willow street, Hoboken............................	4.50 "	"
169	Stover, 56 Willow street, Hoboken............................	3.84 "	"
175	Würdermann, 122 Bloomfield street, Hoboken............	4.14 "	"
177	" " " " "	4.01 "	"
178	" " " " "	4.57 "	"
183	J. B. Proto, 133 Adam street, Hoboken......................	4.72 "	"
187	Podesda, 135 Adam street, Hoboken..........................	3.77 "	"
196	Marco Durlat, ——— ———..................................	4.39 "	"
202	McBride, 143 Washington street, Hoboken..................	4.28 "	"
203	" " " " "	4.09 "	"
204	" " " " "	4.50 "	"
205	" " " " "	3.63 "	"
207	Third street and Willow, Hoboken............................	4.30 "	"
208	" " " "	4.14 "	"

No adulterations of the samples of coffee, which consisted of the whole berries, were found.

CLASS VI.—CHICORY.

Samples 37, 79, 133, 132, 181, 46 and 186 were found to be pure.

COFFEE-ESSENCES.

Samples 194, 158, 156, 173, 105 and 162 were the most adulterated articles which we encountered, inasmuch as they contained no coffee whatsoever, but consisted entirely of chicory, liquorice and caramel. There may be coffee-essences made of coffee, but after failing to find any evidence of such being the case in the six samples examined, further search was abandoned.

CLASS VII.—COCOA AND CHOCOLATE.

NO.	ASH.	FAT.	STARCH.	SUBST. SOL. IN H_2O	MANUFACTURER.
5	3.87	29.86	28.07	13.22	McCobb.
53	4.64	35.57	11.80	9 34	Baker.
......	6.40	14.53	36.10	12.92	Baker.
22	1.39	21.83	25 60	*39.26	Baker's Broma.
10	1.25	21.32	27.64	†35.40	Taylor.
170	3.94	33.72	20.21	6 37	Griffin.

* Cane sugar, 9.47 per cent.
† Cane sugar, 24.55 per cent.

The analysis of No. 10 shows that it is not a cocoa, but a chocolate, and in this case it must be regarded as an adulteration, because the article is labeled "cocoa." No. 22 contains, also, a certain quantity of cane sugar, which properly is a constituent of chocolate.

The determination of the value of the cocoa is connected with some difficulties, since the percentage of fat can not serve as an absolute measure of value. From a medical standpoint the cocoas deprived of fat are to be recommended as being very easily digestible, and so such cocoas are properly made and used. The more fat is abstracted from a cocoa, the larger must be the relative percentage of starch. In the case of cocoas very poor in fat, the ash must increase in the same measure—otherwise the probability would be that the low percentage of fat was derived from added starch. An addition of starch may be easily detected (according to Willstein) if the cocoa is boiled with

water (1:10) and filtered. The filtrate of the pure cocoa does not give any starch reaction. Treated in this way, all filtrates from my samples gave a reaction with iodine. No. 53 was less colored than the rest.

CHOCOLATE.

ASH.	FAT.	INVERT SUGAR.	CANE SUGAR.	STARCH.	MANUFACTURER.
1.95	18.92	3.05	45.44	9.54	Griffin.
3.00	52.84	......	*......	14.64	Baker.
1.93	21.74	......	†40.33	9.68	German.

* Substances soluble in water, 6.24 per cent.
† Substances soluble in water, 51.54 per cent.

The value of chocolate is determined by the amount of cocoa present, as the cane sugar stands much lower in price. One-half to two-thirds of sugar are generally present in the commercial products. The analysis must give the percentage of ash, fat, starch and sugar. The determination of the cane sugar involves in the same time an examination, and, if necessary, a quantitative analysis, of glucose. Chocolates containing glucose were not found by us, but in case they are made they should be marked as adulterated articles.

In making the analysis, a weighed quantity of pulverized chocolate is extracted with ether, the residue treated with water and filtered to a known volume. The insoluble residue is then inverted, and the starch determined als inverted sugar. A similar inversion of the filtrate with a previous examination of glucose gives the amount of cane sugar.

CLASS VIII.—SUGAR AND SYRUPS.

90.	Sugar.	Granulated.	10c. lb.	No glucose.	
88.	Sugar.	Brown.	9c. lb.	3.09 per cent. glucose.	
40.	Sugar.	Brown.	9c. lb.	7.51 per cent. glucose.	
80.	Sugar.	Brown.	8c. lb.	8.66 per cent. glucose.	Dust.
74.	Sugar.	Granulated.	10c. lb.	4.58 per cent. glucose.	
87.	Sugar.	Granulated.	10c. lb.	No glucose.	
32.	Sugar.	Brown.	8c. lb.	3.21 per cent. glucose	
45.	Sugar.	Brown.	8c. lb.	3.57 per cent. glucose.	
70.	Sugar.	Granulated.	13c. lb.	No glucose.	
71.	Syrup.	1 pint 9c.		28.20 per cent. glucose.	11.94 per cent. cane.
73.	Syrup.	1 pint 10c.		18.45 per cent. glucose.	40.85 per cent. cane.
55.	Syrup.	1 pint 9c.		33.30 per cent. glucose.	18.19 per cent. cane.
81.	Syrup.	1 pint 10c.		21.19 per cent. glucose.	22.13 per cent. cane sug.
77.	Syrup.	1 pint 10c.		26.02 per cent. glucose.	29.73 per cent. cane sug.

60.	Syrup.	1 pint 9c.		23.26 per cent. glucose.	41.47 per cent. cane sug.
100.	Syrup.			26.69 per cent. glucose.	35.36 per cent. cane sug.
99.	Syrup.			26.42 per cent. glucose.	31.28 per cent. cane sug.
89.	Sugar.	Brown.	9c. ℔.	9.08 per cent. glucose.	
129.	Sugar.	Brown.	10c. ℔.	2.24 per cent. glucose.	
113.	Sugar.	Brown.	10c. ℔.	3.16 per cent. glucose.	

CLASS IX.—CANDIES.

308. Yellow Cocoa or Cakes,	Glucose.
309. Red Cocoa or Sticks,	Glucose.
310. Peppermint Sticks,	Glucose.
311. Conversation Lozenges,	Glucose and Starch.
312. Lemon Cocoanut,	Glucose.
313. Musk Lozenges,	Glucose and starch, and fluorescent body colored with eosine.
314. Burnt Almonds,	Glucose.
315. Lemon Drops,	Glucose.
316. Liquorice Drops,	Glucose.
317. Mixed Candies,	Glucose.
318. Sarsaparilla Drops,	Glucose (cochineal).
319. Cocoanut Balls,	Glucose.
320. Cinnamon Balls,	Glucose (cochineal).
321. Liquorice Sticks,	Starch and Glucose.
322. Cayenne Pepper Lozenges,	Starch and Glucose.
323. Colored Eggs,	Glucose.
324. Colored Sticks,	Glucose.
325. Colored Sticks,	Glucose.
326. Lemon Cocoanut,	Glucose.
327. Colored Cocoanut Cream,	Glucose.
328. Conversation Lozenges,	Glucose and Starch.
329. Molasses Sticks,	Glucose.
330. Colored Balls,	Glucose.
331. White Balls,	Glucose.
332. Chocolate Balls,	Glucose.
333. Musk Lozenges,	Starch and Glucose.
334. Conversation Lozenges,	Starch and Glucose.
335. Conversation Lozenges,	Starch and Glucose.
336. Conversation Lozenges,	Starch and Glucose.
337. Conversation Lozenges,	Starch and Glucose.

CLASS X.—HONEY.

No. 13. L. Wiedemann, Washington street, Hoboken:

Total Invert Sugar.. 52.27 per cent.
Natural (?) Glucose.. 41.15 "

No. 49. Newman, 306 Grove street, Jersey City:

Total Invert Sugar.. 62.34 per cent.
Natural (?) Glucose.. 28.31 "

The difference between the amount of glucose before and after the inversion was in both numbers very high. No. 49 was very sweet, showing that the difference was probably caused by an addition of cane sugar. The difference being 34.03 per cent. of glucose, 32.33 per cent. of cane sugar was added.

Following the same calculation we find in No. 13 an addition of 10.56 per cent. of cane sugar. If the honey was adulterated with glucose, this difference could be produced by impurities (dextrine) of the glucose. Planta Reichenau finds the difference between pre-existent and inverted glucose in good honeys always very small and below 10 per cent.

CLASS XI.—FLOURS.

All numbers 39, 130, 137, 145, 150, 154, 163, 166, 171, 180, 206, are free from foreign cereals.

No. 36, marked "Corn flour," was Tea Mais Starch.

CLASS XV.—SAGO.

361. 1st and Garden, Hoboken. 362. Bishops, 176 Garden street, Hoboken. 363. 2d and Garden, Hoboken. 364. Coning, 6th and Park avenue, Hoboken. 365. Maas, 3d and Garden, Hoboken. 366. Kohlman, 6th and Garden, Hoboken.	All numbers did not contain any Sago Starch; only Tea Mais.

CLASS XVI.—TAPIOCA.

358. Hasselbrock, Bloomfield and 5th, Hoboken. 359. Wordermann, Hoboken. 360. Bloohm, 6th and Bloomfield. 367. Fehrens, 7th and Park avenue, Hoboken. 368. Ward, 40 Hudson, Hoboken. 369. Menzel, 42 7th street, Hoboken.	Tea Mais Starch, apparently caked together with Wheat Starch.

The results of the examinations of the articles included in Classes XI., XV. and XVI., are strikingly different. For while none of the samples of wheat flour were adulterated, or contained any admixture of foreign cereals, none of the samples of sago or tapioca were genuine, the former consisting of corn starch only, the latter of a mixture of corn starch and wheat starch.

CLASS XVIII.—MILK.

Since the 25th of April, a constant inspection of the milk in Jersey City and Hoboken has been in progress, and along with it an examination of the various methods of testing and analysis. The first analysis was made by the methods of Van Baumhauer, upon Reynolds' milk, 174 Clinton street, Hoboken, April 26th.

Specific gravity (corrected)	1.0293	
Water	87.88	per cent.
Fat	4.04	"
Sugar	3.24	"
Caseine	4.14	"
Ash	0.70	"
Total solids	12.12	"

The second analysis was of milk from T. C. Pupke, 9th and Park avenue; the third from milk No. 208 Railroad avenue, Jersey City; the fourth from P. Connelly, 597 Grove street, Jersey City; the fifth from Reynolds, April 29th; the sixth from the milk of an Alderney cow belonging to Mr. John Stevens. These were all made by the customary methods of analysis, as given in Cairns' Manual.

	II.	III.	IV.	V.	VI.
Specific gravity	1.0281	....	1.0242	1.029	1.02813
Water	87.86	89.02	90.15	89.26	84.96
Fat	3.64	1.49	2.81	2.58	5.56
Sugar	3.58	3.70	2.24	3.81	4.81
Caseine	4.08	....	3.95	3.65	4.54
Ash	0.72	....	0.70	0.70	0.21

No. II. was watered milk; III., IV. and V., both skimmed and watered. No. IV. contained 15 per cent. of water. No. VI. was of great interest, because this milk, according to the lactometer, stood at 97°, a result due not to its being very bad milk, but unusually good milk, the amount of fat being as high as 5.56 per cent. The methods of analysis thus far employed, not being altogether satisfactory, they were abandoned in favor of those devised by Ritthausen and other recent authors, with certain modifications in our own practice. These methods admit of the same degree of precision as in a mineral analysis, and have been pursued in all the work which follows.

MILK ANALYSES—Hoboken and Jersey City.

Number.	DEALER.	STREET AND NUMBER.	CITY.	Solids by Evaporation.	Density at 15°.	Lactometer.	Temperature.	Ash.	Fat.	Sugar.	Albuminoids.	TOTAL.	REMARKS.
1	....	65½ 6th street........	Hoboken ..	....	1.0326	114°	13°	.70	.....	.....	.....	....	....
2	....	Washington, ab. 6th st...	Hoboken ..	....	1.0299	99°	20°	.65	.....	.....	.....	....	....
3	Harken	Sussex street........	Jersey City	12.82	1 0306	100°	22°	.65	4.04	4.44	3.21	12.34	....
4	Blakey	— Warren........	Jersey City	12.02	1.0306	100°	22°	.64	3.25	3.75	3.91	11.55	....
5	....	371 Grove........	Jersey City	11.12	1.0302	100°	20°	.60	3.03	3.86	3.37	10.90	....
6	Guinard	Milkman........	Jersey City	....	1.0306	96°	27°	.....	.....	.....	.....	....	....
7	....	491 Grove street........	Jersey City	10.55	1.0285	92°	24°	.58	2.24	4.53	.....	....	....
8	....	455 Grove street........	Jersey City	11.47	1.0313	102°	23°	.71	4.72	.....	.....	....	....
10	Guinard	Milkman........	Jersey City	12.22	1.0297	97°	22°	.63	3.58	4 39	3.34	11.94	July 8th.
11	Fred. Maas........	3d and Garden........	Hoboken ..	10.89	1.0265	88°	20°	.60	3 26	3.78	2.66	10.30	July 8th.
12	Middleton	N. E. cor. 3d and Garden	Hoboken ..	10.72	1.0284	93°	21°	.52	2.81	3.99	3.01	10.33	July 8th.
13	Fred. Maas........	3d and Garden........	Hoboken ..	10.28	1.0271	90°	20°	.63	2.91	3.84	3.07	10.47	July 11th.
14	....	176 Washington	Hoboken ..	10.91	1.0312	100°	24°	.61	2.92	3.98	2.79	10.30	July 11th.
15	John Bodenstein........	Washington and 3d........	Hoboken ..	10.96	1.0261	83°	25°	.61	.....	.....	.....	....	July 11th.
16	A. Puder........	Gregory and Henderson..	Jersey City	12.50	1.0338	112°	20°	.70	4.	4.38	3.94	....	July 12th.
17	....	146 Montgomery........	Jersey City	12.12	1.0310	102°	21°	.71	3.80	5.14	3.09	12.74	July 12th.
18	J. H. Bodenstein........	3d and Washington........	Hoboken ..	10.93	1.0272	90°	20°	.52	3.53	3.66	2.73	10.44	July 12th.
19	Kampen	S. E. cor. 1st and Clinton	Hoboken ..	11.51	1.029	92°	25°	.65	3.68	3.97	2.94	11.24	July 13th.

MILK ANALYSES—Hoboken and Jersey City.—*Continued.*

Number.	DEALER.	STREET AND NUMBER.	CITY.	Solids by Evaporation.	Density at 15°.	Lactometer.	Temperature.	Ash.	Fat.	Sugar.	Albuminoids.	TOTAL.	REMARKS.
20	Wahlen	Foot 2d and 3d, East Side	Hoboken	....	1.0295	95°	24°	.62	2.79	4.36	2.81	10.58	July 13th.
21	Fred. Maas	3d and Garden	Hoboken	10.07	1.0253	85°	24°	.62	3.48	3.56	1.98	9.64	July 13th.
22	H. Grothensen	87 Washington	Hoboken	10.63	1.0286	92°	24°	.52	......	......	......	....	July 14th.
23	J. H. Bodenstein	3d and Washington	Hoboken	9.71	1.0286	92°	24°	.55	......	......	......	....	July 14th.
24	H. A. Fischer	Milkman	Union Hill	10.84	1.0248	79°	24°	.45	......	......	......	....	July 14th.
25	Fred. Maas	3d and Garden	Hoboken	....	1.0302	100°	20°	......	......	......	......	....	July 18th.
26	J. H. Bodenstein	3d and Washington	Hoboken	....	1.0270	87°	24°	......	......	......	......	....	....
27	J. C. Voss	....	Secaucus	....	1.0337	110°	22°	......	......	......	......	....	....
28	Fred. Konig	10th and Garden	Hoboken	....	1.0295	94°	24°	......	......	......	......	....	....
29	H. A. Fischer	Milkman	Union Hill	10.23	1.0251	79°	25°	.51	3.29	3.22	2.92	9.94	Sold this milk after being informed it was adulterated.
31	Nich. Okleis	149 Park avenue	Hoboken	10.91	1.0280	90°	24°	.54	2.75	3.56	3.57	10.42	....
34	G. N. Bates	D. L. & W. R. R. train	....	10.41	1.0344	121°	12.5°	.69	1.26	4.17	3.75	9.87	....
35	Bates and Howell	D. L. & W. R. R. train	....	10.32	1.0331	113°	13°	.66	1.76	4.38	1.96	....	....
36	H. A. Fisher	Milkman	Union Hill	....	1.0240	79°	20°	.69	3.20	3.24	2.96	10.09	Emptied ab't 10 qts.
37	Bryan and Luthkins	Washington	Hoboken	....	1.0256	90°	12°	......	......	......	......	....	Emptied about 3 pts.
38	2d Duchess of Oxford, R. H. Allen, proprietor	....	....	14.09	....	31°	17°	.79	5.48	4.52	3.52	....	4th milking, taken at Waverly Fair.
39	Ayrshire Flora, 48. Lindsay, proprietor	....	....	12.40	....	32.5°	19°	.61	3.58	5.00	3.10	....	....
40	Woltjen	Cor. 4th and Bloomfield	Hoboken	10.70	....	....	....	......	......	......	......	....	Fined $50. The milk was watered more than 20 per c.

An inspection of these figures will show the composition of the milk usually sold in Jersey City and Hoboken. Legal proceedings for adulteration should have been taken in Nos. 7, 11, 12, 13, 15, 18, 21, 22, 23, 24, 26, 29, 31, and 37. But prosecution was attempted only in case of No. 40, in which judgment was given at once by the justice, and a fine of $50 imposed. It will be noted also that the milk of the Ayrshire cow Flora, 48, which was on exhibition at Waverly Park, and which I had milked under my personal supervision, contained only 12.4 per cent. of total solids.

Some specimens of olive oil were examined, with the following result:

192. Olive oil, pure.
59. Olive oil, with cotton-seed oil, sold for olive oil.
Cotton-seed oil, pure, sold for olive oil.

CLASS XIX.—BUTTER AND OLEOMARGARINE.

A Mr. Pelzer, a dealer, in Union Hill, who was charged with selling oleomargarine, had his stock of butter examined. Determinations of the fat acids in two samples, according to the methods of Hubner and Angell, showed that the samples were butter.

CLASS XXI.—LARD.

Three specimens of lard were examined, of which one contained no water; one sample, 0.23 per cent., and a third 1 per cent. There were no other impurities, and in these cases we failed to obtain instances of the intentional addition of water.

PRESERVING CANS AND ENAMELED VESSELS.

A number of the analyses of the tomatoes contained in cans, showed, in many instances, the presence of both tin and lead. Pickles prepared in white porcelain-lined iron vessels, showed the presence of large quantities of lead, and I doubt not that this is a far greater source of danger than is generally supposed. I have forbidden the use of such vessels in my own household.

CLASS XXX.—MUSTARD.

Number of sample.	Moisture.	Ash.	Fixed oil.	Mustard calculated according to Blythe's formula.	
9	6.93	5.08	15.69	40.27	Wheat flour.
14	3.04	4.81	18.75	49 26	Wheat flour and turmeric.
29	8.05	7.56	15.00	38.24	Wheat flour, terra alba and turmeric.
44	9.49	5.69	9.82	23.00	Wheat flour and turmeric.
57	6.81	5.41	25.44	68.94	Trace of flour and some turmeric.
61	8.27	5.17	11.03	26.56	Wheat flour and turmeric.
136	9.81	3.93	5.13	9.21	Wheat flour, turmeric and cayenne pepper.
67	7.74	3.62	8.39	18.80	Wheat flour and cayenne pepper.
143	8.96	7 59	14.07	35.50	Wheat flour, turmeric and terra alba.
155	9.13	15.19	15.16	37.82	Wheat flour, turmeric and terra alba.
148	7.69	27.85	12.69	31.44	Wheat flour, terra alba.
195	3.86	28.36	9.00	20.59	Wheat flour, turmeric and terra alba.
141	9.18	4.40	17.18	44.65	Wheat flour and turmeric.
161	9.18	4.90	11.83	28.91	Wheat flour.
164	6.64	3.10	20.43	54.51	Flour and turmeric.
168	8.90	11.86	14.82	34.76	Flour, turmeric and terra alba.
176	9.83	4.18	9.65	22.50	Flour.
185	9 51	16.69	10.26	24.29	Flour, turmeric and terra alba.
201	9.54	4.01	10.36	24.59	Flour and turmeric.
210	8.18	6.83	15.75	40.44	Flour and turmeric.
375	....	4.60	17.77	44.74	Flour.
376	....	11.67	24.00	63.40	Flour, turmeric and terra alba.
377	....	4.64	21.30	55.60	Flour and turmeric.
378	....	18.38	20.28	52.70	Flour and terra alba.
379	....	3.78	30.14	81.10	Flour.
......	8.60	4.91	22.70	....	
....	7.10	5.10	22.83	70.92	

These samples, being to a greater or less degree unsatisfactory, I was glad to receive from Dr. W. K. Newton, a sample of mustard which he had obtained from the manufacturers as a perfectly pure article. It contained—

Moisture............................	8.60 per cent.			
Ash....................................	4.91 "	(1st anal.),	4.71 (2d anal.)	
Fixed oil..........................	22.70 "	"	21.55 "	

There was no starch or any other impurity present. Learning that this sample came from H. K. & F. B. Thurber, I obtained from a shop a quarter-pound package of their mustard, labeled E. G. Mustard, and analyzed it, with the result of finding—

Moisture	7.10	per cent.
Ash	5.10	"
Fixed oil	22.83	"
Mustard after extraction of oil (direct determination)	70.92	"

This makes the oil removed from the seed, in process of manufacture, 12.47 per cent. The manufacturers stated that it was necessary to remove as large an amount of oil as this, to prevent the mustard becoming rancid. Admitting this to be the case, then the above sample was pure, unadulterated mustard.

CLASS XXXI.—PEPPER.

Number.	DEALER.	ASH.	REMARKS.
1	Koch, Washington and Myrtle ave., Brooklyn	7.14	Contains sand.
15	L. Wiedemann, Washington street, Hoboken	6.75	Contains sand and flour.
36	Corner Coal street and Railroad avenue, Jersey City	6.00	Contains mineral impurities and flour.
41	Wilson & McGeness, 2d and Erie, Jersey City	4.36	Contains much flour.
48	69 York street, Jersey City	3.59	Contains sand and flour.
75	Grocery, opposite 275 Halsey street, Newark	5.43	Contains sand and much flour.
97		5.12	Contains a little sand, otherwise pure.
198	Ernst, 158 Park avenue, Hoboken	6.11	Contains sand and much flour.
226	Hasselbrock, Bloomfield and 5th, Hoboken	3.54	Contains sand and flour.
231	Bishop, 176 Garden street, Hoboken	4.69	Contains sand and flour.
238	Park avenue and 7th street, Hoboken	3.59	Contains sand and much flour.
240	C. Wendt, Willow and 6th, Hoboken	5.65	Contains sand and flour.
241	Koning, Park avenue and 6th street	6.17	Contains sand and flour.
242	H. Kohlmann, Garden and 6th street	5.13	Contains sand and much flour.
247	Rosenberg, Washington street, Hoboken	4.66	Contains sand and flour.
248	Maas, Garden and 3d, Hoboken	4.88	Contains sand and flour.
251	Nehr, Park avenue and 4th, Hoboken	4.48	Contains sand and flour.
254	Moses Black	4.33	Contains sand, otherwise pure.
257	Pupke, Washington and 5th streets, Hoboken	3.69	Contains sand, otherwise pure.
260	Peters, Washington and 6th, Hoboken	3.74	Contains sand, otherwise pure.
265	Tom Ward, 40 Hudson street, Hoboken	5.46	Contains sand and little flour.
271	Manzel, 42 7th street, Hoboken	3.81	Contains sand and flour.
274	——— 10th and Willow, Hoboken	6.96	Contains sand, otherwise pure.
278	Vogler, 8th and Bloomfield	7.25	Contains sand and mineral impurities, otherwise pure.
282	Rugge, 8th and Garden	5.34	Contains sand and flour.
293	Fink, Newark and Washington	4.48	Contains sand and flour.

From the foregoing, it will be seen that the presence of sand and other mineral matters, due to unclean pepper-corns, is very common. Various kinds of flour and starch were very frequently present. Search was made for the hulls of mustard and buckwheat, for the woody tissue of cocoanut shells and ground charcoal, but without success.

CLASS XXXII.—GROUND CAYENNE PEPPER.

42. Wilson & McGeness, Second and Erie, Jersey City:
Ash, 5.17 per cent.; red Fe_2O_3; micr. pure.
58. James Love, Newark avenue, Jersey City:
Ash, 5.10 per cent.; ash white; micr. pure.
62. McDonald's cheap cash store, Jersey City:
Ash, 5.85 per cent.; ash red Fe_2O_3; micr. much ordin. pepper.
69. Love Bros., Market and Washington, Newark:
Ash, 6.20 per cent.; ash red Fe_2O_3; micr. addition of Tea Mais.
216. Park avenue and Fifth, Hoboken:
Ash, 5.10 per cent.; ash red Fe_2O_3; micr. addition of pepper.
233. Hasselbrock, Bloomfield and Fifth, Hoboken:
Ash, 8.13 per cent.; (sand and impurities;) micr. pure.
233. H. Bishop, 176 Garden street, Hoboken:
Ash, 5.54 per cent.; (sand;) micr. pure.
249. Mars, Garden and Third, Hoboken:
Ash, 3.65 per cent.; micr. no foreign addition.
Ash red Fe_2O_3.
253. Moses Black, Hoboken:
Ash, 5.50 per cent.; ash red Fe_2O_3; micr. addition of Tea Mais.
261. H. N. Peters, Washington and Sixth, Hoboken:
Ash, 5.42 per cent.; micr. pure.
281. Rugge, Eighth and Garden, Hoboken:
Ash, 5.16 per cent.; ash red (impurities); micr. addition leguminous flour.
297. Fink, Newark and Washington, Hoboken:
Ash, 4.82 per cent.; micr. no foreign addition.

Sand and red oxide of iron or red clay, together with corn starch, ordinary black pepper and pea and bean flour, were the adulterants present.

CLASS XXXIII.—CLOVES.

4. Ash, 7.37 per cent.; impurities; micr. pure.
19. Ash, 3.93 per cent.; micr. addition of flour.
63. Ash, 3.57 per cent.; micr. pure.
56. Ash, 7.30 per cent.; micr. leguminous flour.
68. Ash, 5.77 per cent.; micr. pure.
200. Ash, 5.22 per cent.; micr. pure.
217. Ash, 4.67 per cent.; micr. addition of flour.
227. Ash, 8.22 per cent.; (sand and Fe_2O_3;) micr. no foreign addition.
230. Ash, 4.30 per cent; micr. pure.
244. Ash, 3.46 per cent.; micr. pure.
262. Ash, 7.03 per cent.; (imp.) micr. pure.
268. Ash, 6.22 per cent.; micr. pure.
286. Ash, 7.30 per cent.; sand and Fe_2O_3; micr. pure.
298. Ash, 7.03 per cent.; (imp.) micr. no foreign addition.

The flour is stated to be derived from ground crackers. We did not find evidences of ground cocoa shells, said to be sometimes used.

GINGERS.

The ash of all the gingers contained more or less sand and impurities. Microscopically, they were all without addition of flour.

21.	Grassmann, 161 Washington, Hoboken,	Ash, 4.90 per cent.
52.	Newman, 306 Grove street, Jersey City,	Ash, 4.20 "
65.	McDonald's cheap cash store, Jersey City,	Ash, 5.19 "
259.	H. N. Peters, Washington and Sixth streets, Hoboken,	Ash, 1.68 "
85.	Sheridan & Fagan, 7 Ferry street and Newark, Hoboken,	Ash, 4.18 "
107.	———	Ash, 4.98 "
188.	Podesda, 135 Adam street, Hoboken,	Ash, 7.18 "
215.	A. H. Blohm, Sixth and Bloomfield, Hoboken,	Ash, 4.58 "
229.	H. Bishop, 176 Garden street, Hoboken,	Ash, 6.96 "
255.	Moses Black,	Ash, 5.98 "
222.	Hasselbrock, Bloomfield and Fifth, Hoboken,	Ash, 4.32 "
267.	Menzel, 42 Seventh street, Hoboken,	Ash, 4.54 "
276.	Claus Iagls, Tenth and Willow, Hoboken,	Ash, 4.62 "
277.	Vogler, Eighth and Bloomfield, Hoboken,	Ash, 4.47 "
288.	Köhler, Ninth and Park avenue, Hoboken,	Ash, 6.68 "
283.	Tenth and Garden, Hoboken,	Ash, 6.70 "
294.	Fink, Newark and Washington streets, Hoboken,	Ash, 4.98 "

MACE.

The maces were examined with the microscope, and the ash, for mineral impurities, by chemical analysis.

270. Ash, 1.70 per cent. Adulterated with corn starch.
72. Ash, 20.19 per cent. Adulterated with corn starch, terra alba and ochre, besides containing much sand.
220. Ash, 3.06 per cent. Adulterated largely with corn starch, besides containing some sand and ochre.
287. Ash, 2.47 per cent. Adulterated with corn starch and wheat starch.
213. Ash, 3.19 per cent. Adulterated with wheat flour.
252. Ash, 2.01 per cent. Pure.
289. Ash, 2.28 per cent. Adulterated with corn starch and turmeric.
103. Ash, 2.21 per cent. Adulterated with corn starch.
197. Ash, 3.29 per cent. Adulterated with wheat flour and a little ochre.

ALLSPICE.

The examination was made by the microscope and by determining the ash.

269. Ash, 4.91 per cent. Adulterated with wheat flour.
17. Ash, 3.86 per cent. Pure.
219. Ash, 3.57 per cent. Adulterated with foreign woody tissue and starch.
191. Ash, 3.31 per cent. Adulterated with wheat flour.
50. Ash, 3.99 per cent. Adulterated with wheat flour.
284. Ash, 5.48 per cent. Adulterated with wheat starch and foreign woody tissue. Contains some sand.
291. Ash, 4.24 per cent. Pure.
199. Ash, 6.45 per cent. Contains foreign woody tissue and a little sand.
232. Ash, 2.66 per cent. Pure.
243. Ash, 6.68 per cent. Pure, except a little sand.
296. Ash, 3.34 per cent. Pure.
214. Ash, 4.81 per cent. Contains foreign woody tissue and some rice flour.
266. Ash, 4.06 per cent. Adulterated with corn starch and foreign woody tissue.
3. Ash, 5.00 per cent. Adulterated with corn starch and foreign woody tissue. Contains a little sand.

CINNAMON.

In the case of cinnamons the ash was determined in order to detect mineral adulteration, the rest of the analysis being made by the microscope.

82. Ash, 4.13 per cent. Normal. Adulterated with corn starch.
189. Ash, 3.20 per cent. Normal. Pure.
64. Ash, 3.51 per cent. Normal. Adulterated with corn starch.
16. Ash, 3.98 per cent. Normal. Pure.
2. Ash, 3.60 per cent. Normal. Adulterated with wheat starch.
295. Ash, 3.72 per cent. Normal. Adulterated with wheat starch and corn starch.
184. Ash, 4.98 per cent. Above normal. Sand. Otherwise pure.
236. Ash, 1.89 per cent. Below normal. Adulterated with corn starch.
225. Ash, 4.29 per cent. Adulterated with starch.
235. Ash, 2.54 per cent. Adulterated with wheat starch and corn starch.
264. Ash, 3.36 per cent. Normal. Pure.
31. Ash, 3.35 per cent. Normal. Pure.
292. Ash, 4.96 per cent. Above normal. Some sand, and adulterated with starch.
272. Ash, 2.47 per cent. Adulterated with starch.

CLASS XXXVIII.—VINEGAR.

The vinegars were examined for foreign mineral acids, and for metallic impurities, especially copper and lead. In testing for H Cl, H_2SO_4 and H NO_3, a dilute solution of methylanilin violet was

employed. When these acids are present in vinegars, a blue or green coloration is produced on the addition of the violet. The amount of acetic acid in each vinegar was determined by estimating the specific gravity of the destillate.

1. C. Kerr, 147 Grove street, Jersey City, 3.06 per cent. acetic acid; source not noted; acetic acid, 4.50 per cent.
2. Newark avenue, Jersey City, 4.38 per cent. acetic acid; source not noted; acetic acid, 4.20 per cent.
3. 69 York street, Jersey City, 3.42 per cent. acetic acid; source not noted; acetic acid, 4.10 per cent.
4. Source not noted; acetic acid, 3.4 per cent.

In none of the above vinegars was any foreign mineral acid present. Very slight traces of lead, however, were found in each.

5. White vinegar, Fincken's, Newark street, Hoboken, contained 4.18 per cent. acetic acid.
6. Cider vinegar, Drescher's, Fourth and Washington streets, Hoboken, contained 3.90 per cent. acetic acid.
7. White wine vinegar, Brückner's, Washington street, Hoboken, 7 48 per cent. acetic acid.
8. White wine vinegar, Stretch's, Grand and Second streets, Hoboken, 6.89 per cent. acetic acid.

Nos. 5 to 8 contained no foreign acid or deleterious substance. 7 and 8 contained, however, a much larger percentage of acetic acid than the others, and were correspondingly more valuable.

CLASS XXXIX.—PICKLES.

Of the seventeen samples of pickles exampled, all but four, samples Nos. 342, 346, 350 and 354, contained copper. These last were, in every case, of different appearance from those containing copper, being of a yellow color instead of green.

CLASS LI.—DRUGS.

375. Rad. tarax., badly adulterated, 20.08 per cent. ash (ochre and clay).
376. Powd. jalap root, 1.80 per cent ash and 20.25 per cent. extract; resin, 15.18 per cent.
377. Senega, 4.77 per cent. ash.
378. Lobelia, 7.33 per cent. ash (sand and imp.)
379. Serpentaria, 13.90 per cent. ash (sand and clay).
380. Lera, no paraffin.
381. Sapo.
382. Oleum bergam., not adulterated.
383. Balsam Peruv., not adulterated.

384. Balsam tolu, not adulterated.
385. Benzoë, not adulterated.
386. Ipecac., 3.35 per cent. ash.
387. Saffran, not adulterated.

388. Extract of pineapple, 389. Extract of raspberry, 390. Extract of strawberry,	Artificial ethers.
7. Extract of lemon, 8. Extract of lemon, 6. Extract of bitter almond, 12. Extract of lemon, 11. Extract of bitter almond,	No extracts, but essences of oils, more or less diluted.

391–396. Aniline colors (for confectionery use).
393. "Yellow" was a nitro-compound.

CLASS LII.—CREAM OF TARTAR.

In making the quantitative analysis of the different samples, the cream of tartar ($C_4 H_5 K O_6$) was calculated from the amount of normal soda solution used. A qualitative analysis was also made to determine whether starch, terra alba, &c., were present or not.

258. Cream of tartar present, 89.03 per cent. No starch or terra alba. ($Ca S O_4$.)
245. Cream of tartar present, 71.66 per cent. Adulterated with starch and terra alba. ($Ca S O_4$.)
237. Cream of tartar, 26.51 per cent. Adulterated very largely with starch and terra alba. ($Ca S O_4$.)
246. Cream of tartar, 97.56 per cent. Pure.
256. Cream of tartar, 93.75 per cent. Pure.
218. Cream of tartar, 52.12 per cent. Adulterated principally with terra alba. ($Ca S O_4$.) No starch.
250. Cream of tartar, 30.57 per cent. Adulterated with terra alba and starch.
234. Cream of tartar, 97.36 per cent. Pure.
239. Cream of tartar, 15.78 per cent. Adulterated with terra alba. ($Ca S O_4$.)
224. Cream of tartar, 89.43 per cent. No starch or terra alba.
279. Cream of tartar, 43.25 per cent. Adulterated with starch and terra alba.
263. Cream of tartar, 93.09 per cent. Pure.
285. Cream of tartar, 13 63 per cent. Adulterated with starch and terra alba.
275. Cream of tartar, 85.17 per cent. Adulterated with terra alba.
290. Cream of tartar, 10.88 per cent. Adulterated with starch and terra alba.
309. Cream of tartar, 88.59 per cent. No adulterants found except a little terra alba.
380. Cream of tartar, 91.55 per cent. Pure.

II.—REPORT OF PROF. H. B. CORNWALL.

The Council requested me especially to examine flour, bread, baking powders, vinegar, spices, flavoring extracts, canned vegetables, and drugs. The time allotted to the examination being necessarily limited, I thought it best to examine, chiefly, such articles as admitted of rapid tests, and thus to go over a larger number of specimens, without entirely neglecting those requiring more tedious processes.

It is not the design of this report to occupy much space with discussions of the deleterious effects of any adulterations found, but rather to state the results of the tests.

Unless otherwise stated, all the articles were purchased by me, in this State, in different towns.

Flour.—One specimen was tested for all mineral impurities, and none were found.

Bread.—Three loaves, from different bakers, were tested for evidences of the addition of alum. Two showed evidence of its addition by the presence of considerable quantities of alumina in the ash. The third was found to contain alumina corresponding to the addition of 3.82 grains of alum per pound of bread.

This is only about one-fifth of the quantity which Hassall states as frequently used by English bakers, but the amount added by them varies from none to twenty grains, according to the nature of the flour used. A very few authorities have maintained that the moderate use of alum is beneficial, because it makes the bread lighter, but its use by bakers doubtless depends upon its making a better looking bread from an inferior flour. In so far as this is true, it constitutes an imposition on the public, while there are good grounds for fearing that alum is often used in quantities that exert a decidedly injurious effect. The following are the chief arguments against its use: that it renders the gluten less digestible; probably forms compounds of difficult solubility with the phosphates of the flour, thus depriving the consumer of one of the most valuable constituents; and finally, sets free sulphate of potash in quantities liable to derange, at least, weak digestive systems.

CANNED VEGETABLES.

Canned Vegetables were examined for tin, lead and copper.

The tin of every can, eight specimens in all, was tested for lead and

copper, and found to be of excellent quality; one can alone showing the slightest trace of copper.

Apples.—One can was found to contain tin, dissolved in the contents, in the proportion of .23 grain per quart can.

Peaches, Corn and Peas.—One can of each were found to contain only traces of tin; in the peas, traces of lead were detected.

Asparagus.—One quart can contained 4.13 grains of dissolved tin, with very evident traces of lead.

Tomatoes.—One quart can contained 1.28 grains of tin; a second, 3.39 grains, the contents of this can being slightly sour when first opened, although the can was tight; the third contained 1.3 grains of tin and .1 grain of lead per quart of contents, the total contents weighing 17,150 grains, or nearly 2½ pounds avoirdupois, as estimated after a portion had been removed.

With the exception of the asparagus and the slightly sour tomatoes, there is no reason to suppose that the tin in any of these articles would be injurious to health, but it would be well to ascertain whether certain vegetables act much more strongly than others on tin. It is doubtless also true that sour canned vegetables may contain an undue amount of tin, as might be readily inferred without analysis.

With regard to the lead found in suspiciously large quantity in one can of tomatoes, and in several cans of other articles in traces, it must have come from the solder. The tomato can showed a band of solder, very thin indeed, about one-quarter of an inch wide all around both the top and bottom of the inside of the can, and a similar, but generally narrower band, was found inside of nearly all the cans. It seems unfortunate that, after selecting pure sheet tin, the manufacturers should not avoid so evident a source of danger in making up the cans, for there is no doubt that the free and constant use of some vegetables so canned may expose the consumer to the risk of taking too much lead into his system. I have no hesitation in mentioning these facts, since there seems to be a remedy for the evil.

In analyzing the canned goods and bread, I have received valuable assistance from Mr. L. D. Ricketts, of Princeton.

CREAM OF TARTAR.

Cream of Tartar.—Six specimens were examined. One bought at a first-class grocery and one at a drug store, proved to be reasonably pure cream of tartar, the first specimen containing a very moderate

quantity of tartrate of lime, a natural impurity, which was present only in traces in the other. One specimen received from Dr. Newell was equally good, but a second was very bad, containing more flour and plaster of Paris than cream of tartar. Two other specimens from second-class groceries were tested. One was good, the other was composed chiefly of alum and flour, with some cream of tartar. The flour was easily recognizable under the microscope, and in polarized light the alum and cream of tartar were readily distinguishable, although even ordinary light showed most of the alum plainly. Analysis revealed its presence also, and probably less than one-third of the mixture was true cream of tartar. I have no doubt that this article is subject to very extensive adulteration. Apart from the discouraging results to the cook, who in one case may be adding alum and in another true cream of tartar to his cakes, there is a serious objection to the sale of alum in such a guise. The food prepared with it must be less digestible and will certainly contain more or less sulphate of soda, a very undesirable salt to take into the digestive system.

Mustard.—Seven specimens were examined. One had much wheat flour, and was very weak, its yellow color being maintained by addition of turmeric; another was a more than ordinarily good mustard, having little flour, no turmeric and a strong flavor; the third and fourth (one of them from Dr. Newell) were weak and contained much flour, but no turmeric; the fifth contained much flour, plaster of Paris and white clay, with a large quantity of turmeric, as might have been expected would be necessary, and its taste was very weak; the sixth had much starch, little turmeric, and was weak; the seventh had a moderate quantity of flour, much turmeric, and was strong. It was received from Dr. W. K. Newton, the person giving it to him having warranted it pure.

Flour, starch and turmeric are considered by the trade as legitimate additions to mustard. It may with reason be claimed, perhaps, that the first two do mollify the flavor in an agreeable way, but addition of turmeric is nothing but a fraud, being practiced solely to render the mustard more attractive in appearance, and thus serving as a convenient means of concealing, from the eye at least, an undue addition of flour. It is certainly desirable that if the flour is added it should be honestly done. A mustard plaster made from some of the above specimens would be of very little use.

Red Pepper (*Cayenne*).—Four samples were examined. No min-

eral impurities were found except red oxide of iron, but the results show universal adulteration. One specimen was very weak in flavor, gave much ash, containing oxide of iron in quantity, and had been freely mixed with deliquescent chlorides (of potassium certainly, and probably of magnesium,) apparently to give it a bright, fresh color, and perhaps to add to its pungency.

A second specimen gave rather more than a legitimate quantity of ash, otherwise it was good; a third contained considerable oxide of iron, and it, as well as the fourth, had been mixed with a large quantity of tasteless, reddish brown, woody fibre, the exact nature of which I have not yet tried to ascertain. In the fourth sample this had been added in the grossest way, apparently without any attempt at intimate mixture, but it appeared in aggregated masses as large as a chestnut. All the samples were bought at groceries.

The following drugs were tested, partly for adulteration, and partly for accidental impurities due to imperfect purification.

Rhubarb.—Six specimens of powdered rhubarb, all from drug stores, the best quality being specified whenever the question was asked. They were examined especially for fraudulent coloring with turmeric. None showed this, but one contained much chalk, and one or two were of very inferior quality.

Copaiba Balsam.—Five specimens were tested for the commonest adulterations. Two were pure; one contained a fat oil as an adulteration, although its appearance was excellent; a specimen from Dr. Newell contained a fat oil, and another, also from him, contained turpentine and oil. Both of these last were wretched-looking specimens, in which the foreign admixtures were apparent to the most inexperienced observer.

Bismuth subnitrate and *bismuth carbonate.*—Six specimens of the former and four of the latter were examined, eight of them being from Dr. Newell. All were free from lead, arsenic and antimony in appreciable quantities, although traces of arsenic were found in nearly all. This fact is not regarded as interfering with their usefulness.

Scammony (*powdered Virgin.*)—One specimen was excellent; another contained much starch. Scammony is very expensive, and probably often adulterated.

Calomel.—Four specimens were examined, especially for corrosive sublimate. Two were from Dr. Newell, and all were pure.

Citric acid.—Two specimens from Dr. Newell were examined,

especially for tartaric acid, which was not found. One of the specimens contained a small quantity of some sulphate, probably sulphate of lime, resulting from imperfect purification.

Potassium bromide.—Four specimens, including one from Dr. Newell, examined especially for chlorides, were found pure.

Tartar emetic.—One specimen, from Dr. Newell, was free from any ordinary impurities.

Manna.—Two specimens were pure.

Gum arabic.—Two specimens were pure.

Magnesium carbonate and *magnesia.*—One specimen of each, examined especially for lime, were practically free from it.

Quinine sulphate.—Three specimens were tested for the cheaper allied alkaloids, but found to be of standard quality.

Cinchona sulphate.—Three specimens were found to be of standard quality.

Peruvian balsam.—Three specimens were received from Dr. Newell. One contained a fat oil, and looked very bad; another contained alcohol and a fat oil; the third was a very poor specimen in appearance, and smelled strongly of turpentine. It scarcely seemed possible that such specimens could be sold to any intelligent druggist.

Olive oil.—One specimen, bought of a respectable druggist as "olive oil," was cotton-seed oil, pure and simple.

It is evident that adulterations are to be found among articles sold as drugs by druggists.

In my next report I hope to be able to give results of further investigations of canned vegetables and some of the drugs requiring more elaborate tests, both as to quality and officinal strength of solutions, etc., as well as of some others of the articles assigned to me, which could not be examined in time for this report.

III.—REPORT OF PROF. F. C. VAN DYCK.

(MICROSCOPIC EXAMINATION OF SEVEN SAMPLES SUBMITTED BY PROF. LEEDS.)

TEAS.

No. 1.—No foreign leaves were identified in this specimen. The quality seemed to be very fair, the absence of excessive amount of stems and of discolored leaves being noticeable.

No. 2.—Consisted of blackish, badly-rolled leaves, mixed with a quantity of bluish green leaves of unnatural appearance. Gave the impression of spent tea, dried and mixed with fresh of poor quality. Full of stems.

No. 3.—Mostly bluish green, containing less stems than No. 2, but "glazy" looking. No foreign leaves were identified in either No. 2 or No. 3.

No. 4.—Marked "Green Tea, VI–18." Not examined in detail.

COFFEE.

Marked "Essence of Coffee, VI–18."

Under the microscope none of the marks of coffee could be found, not even oil globules. Nor was chicory present. The brownish, translucent scales or flakes which composed the insoluble residue were not identified.

MUSTARD.

Marked "Mustard, No. III."

The bulk of this sample consisted of wheaten flour.

ARROWROOT.

Marked "Arrowroot, VI–18."

A very careful examination, including measurements of the starch grains, failed to discover anything but starch granules of Bermuda arrowroot (Maranta).

IV.—REPORT OF WM. H. NEWELL, M. D.

ARTICLES EXAMINED MICROSCOPICALLY.	Number of Specimens Examined.	Amount Pure.	Amount Adulterated.	Number of each kind.	SUBSTANCES ADULTERATED WITH
Coffee	42	0	42	12	Chicory.
				6	Chicory, roasted corn and beans.
				5	Chicory and beans.
				8	Chicory, potato flour and corn.
				4	Chicory and corn.
				3	Chicory and rye.
				4	Chicory and potato flour.
Cocoa	21	4	17	3	Wheat flour.
				1	Wheat flour and potato flour.
				3	Wheat flour and sago.
				4	Sago.
				5	Arrowroot.
				1	Potato flour and tapioca.
Arrowroot	19	3	16	16	Potato starch.
Mustard	35	0	35	5	Wheat flour.
				6	Wheat flour and turmeric.
				10	Wheat flour, cayenne and turmeric.
				5	Rape seed.
				9	Starch, cayenne and turmeric.
Pepper	26	0	26	9	Wheat flour.
				4	Rice flour.
				5	Rape seed and dust.
				8	Linseed meal and dust.
Cinnamon	10	5	5	5	Cassia.
Sago	15	9	6	6	Potato starch.
Tapioca	14	8	6	6	Potato starch.
Tea	52	21	31	6	Foreign leaves.
				10	Foreign leaves and dust.
				4	Lie tea.
				6	Lie tea and dust.
				5	Dust.
Cayenne	16	4	12	5	Rice and turmeric.
				7	Corn.
Ginger	28	3	25	5	Rice flour, turmeric and cayenne.
				1	Rice flour.
				7	Potato flour.
				4	Potato flour, turmeric and cayenne.
				5	Wheat flour.
				3	Wheat flour, turmeric and cayenne.
Licorice	25	5	20	3	Wheat flour.
				8	Wheat flour and turmeric.
				7	Arrowroot.
				1	Arrowroot and wheat flour.
				1	Arrowroot and turmeric.

V.—REPORT OF SHIPPEN WALLACE.

I would report that, according to the arrangement we made last spring for the examination of articles of food, I have examined samples of sugar, syrups, confectionery and baking powders, and have also tested a number of burning fluids.

SUGAR.

The adulterant in sugars and its compounds is, as is generally known, what is termed glucose or grape sugar. This article is prepared at the present time on a very large scale, from corn or starch, by the action of acids, and there has probably never been an article which has had more written about it, showing the dense ignorance of the writers on the subject, than it has had. In the method of manufacture it is not possible for any *free* acid to exist in it. Traces of lime, in combination with sulphuric acid, forming sulphate of lime, are found, but this I should not consider injurious in the amount found, and dextrin, caused by the imperfect decomposition of the starch, is always present in glucose syrup to a large extent, and in the grape sugar to a lesser. The uses are numerous, but for our purposes we will confine it to its nse as an adulterant for sugar. In all my experience, and I consider I have had considerable, I have never found what is known as "loaf," "crushed" and "granulated" adulterated with it. What are known as "coffee grades" are largely mixed with it, and are sold in the market by the name of "new process sugar," and this is known not only to the wholesale dealer, but also to the retailer, but not to the purchaser, who buys with the idea that he is obtaining cane sugar. Molasses or syrups are largely adulterated with it, the object being to produce a fine-looking, running, and (to some persons) tasting article; the commercial name of the unadulterated article being known as "straight syrup," the other "mixed." The adulterated article is now sold in groceries to a larger extent than the straight goods, and this is owing to the people preferring it, and consequently the retailer supplies it.

Confectionery, we may state, is, as a rule, largely composed of "grape sugar," certain candies being composed entirely of it. Besides, we have found "terra alba" (a fine, white earth), starch and flour, and gelatin, together with the coloring agents—some of which are harmless, others not.

BAKING POWDER.

The article which enters largely into household use, and which is probably adulterated to the greatest extent, is baking powder. I have found as much as forty per cent. of flour in one sample I examined. Alum is also found, and in one sample, owing to the materials used, I found over three per cent. magnesia, in the form of "epsom salts."

KEROSENE.

One article of house use, but with which our council has nothing to do, is one which I consider of the greatest importance, and that is "burning fluids." There is a statute at present bearing on the subject, but it is a dead letter. I have examined twenty-three samples at the request of various persons, and found fifteen to ignite at the ordinary temperature, three at 92°, two at 97°, and the other three at 108°; all of these were unsafe and dangerous to use, and in one case caused a loss of several hundred dollars. There should be a law, properly drawn and enforced, prohibiting the sale of kerosene which has a lower flashing point than 115°, at least. Accidents are constantly occurring from the use of the cheap oils, causing the loss of life and property in many instances, and I consider there is nearly, if not quite, as much danger to the community from this cause, as from adulterated food and drugs.

GLUCOSE.

The term "glucose," I do not like, and should prefer to use the true chemical one of dextrose, or dextro-glucose, as we find the same substance existing naturally in all molasses and syrups, the only difference being that in the latter case its action on polarized light is to the left, whence its name "levulose," or levulo-glucose, and the term "glucose" is often used indiscriminately for both, in which case the community, not being posted, cannot tell which is meant. I should, therefore, suggest that in all reports which we may hereafter make, we use the term dextrose, with the commercial name in parentheses. Commercially, "glucose" is the syrup, and "grape sugar" the sugar, also known as corn or starch sugar. One person has suggested the name "amylose," from its being made from starch; this, however, is only increasing the number of names for the same substance.

MILK.

I have also made a number of milk analyses for Dr. Newton, of the milk condemned by him in Camden, and found he was thoroughly justified in his action, despite the opinions expressed by interested parties, in the newspapers, to the contrary.

This report is qualitative rather than quantitive, as I understood we were to examine, in a general manner, articles of food, and learn as to the amount of adulteration. Having now looked the field over, we can the coming year enter more into detail, and obtain the percentage of adulteration in the more common articles of food, and, I have no doubt, obtain valuable information for not only our own use, but also for that of other councils similar to our own.

VI.—REPORT OF WILLIAM K. NEWTON, M. D.

OLEOMARGARINE.

The manufacture of oleomargarine, or butterine, as it is sometimes called, has, within the past four years, grown to vast proportions. There are six factories in New York making this material; one factory in New York city alone producing about 30,000 pounds daily. The total amount sold and consumed in our State is not known, but it must be enormous. It is sold in all our cities, but we know of but few instances where the purchaser is informed as to the character of the article sold him—he being led to believe that it is genuine butter that is offered for sale.

The process of manufacture is as follows: Fresh beef fat is melted at as low a temperature as possible, never higher than 126°–128° F. All membrane and tissue is then removed, and the resulting clear fat is put into presses, where the stearine is extracted. The liquid fat, free from tissue and with nearly all its stearine removed, is known as "oleomargarine oil." The next step in the process is "churning." The oil is allowed to run into churns containing milk and a small quantity of coloring material (annatto), where, by means of rapidly revolving paddles, it is churned for about an hour. When this part of the process is complete, the substance is drawn off, from the bottom of the churn,

into cracked ice. When cool it is taken from the ice, mixed with a proper amount of salt, and is then worked like butter and put into firkins for the market. It is also moulded into attractive prints, in imitation of dairy butter.

In a well-conducted factory all the steps of the process are devoid of any offensive smell, and when fresh, clean fat is used, the resulting "oleomargarine" is a substance having an uniform color, taste and consistence, and well calculated to deceive any person, except he be an expert. So many improvements have been made in the process of manufacture that even the chemist may be misled when he seeks by analysis to determine whether or not it be true or imitation butter.

Oleomargarine is sold for butter, is used to adulterate butter, and in various ways is employed to sophisticate dairy products.

In the process of manufacture, cotton-seed oil and peanut oil are substituted by some makers for a portion of the beef fat.

The "oleomargarine oil," previously described, is made in large quantities, and is rapidly becoming one of the great adulterants. It is exported to Europe, and is used in this country to mix with butter, or to add to the cream in the churn before churning.

Instances have been brought to our notice where farmers have bought this article, added it to the butter, and sold the butter as a pure article. Mr. Shippen Wallace relates a case where a farmer in the western part of this State sends to Philadelphia butter put up in attractive pound prints, selling for a high price, the purchaser thinking that it is an article superior in taste and appearance and of undoubted purity, yet the "butter" is made from this oil, bought at the Philadelphia factory, and which is churned up with the milk at the dairy.

This oil has been used in cheese-making, but lard is now employed in its place. The oil is also added to ice cream as a substitute for cream.

When all the steps of the process of making oleomargarine are conducted with a due regard for cleanliness, a perfectly healthful product is made, but in New York one or two factories have produced an article not answering the requirements of a healthful food; the material they made, however, did not meet with a ready sale, and the work was suspended. To produce a merchantable article it is absolutely necessary that none but sweet fat be used; any taint or any trace of putridity or bad odor will stop the sale. Thus a possible

evil has its own remedy. Some manufacturers are in the habit of adding cotton-seed oil to the fat, before churning, thus increasing the profits of an already profitable business. While there is nothing injurious in cotton-seed oil, yet the fraudulent practice should not be allowed.

The question of the possibility of tuberculosis being introduced into the human system, by the use of fat from cattle affected with this disease, has come up recently for discussion. We are inclined to think that the danger is very small. The temperature, in the process, is never raised to a degree high enough to destroy the activity of tubercle, but as this neoplasm is rarely or never found in the adipose tissue, even the fat of animals affected with this disease may be eaten without much risk. The same may be said of the entozoa. Trichinæ are never found in the bovine species, unless introduced for experiment, and even if they did infest cattle they are never found in the fat.

We may sum up by saying that the manufacture of oleomargarine should be very carefully conducted, and, to insure absolute safety, the fat should not be used from unhealthy cattle or from swine.

May oleomargarine be classed as a healthful article of food? The substance is closely allied, chemically, to butter, and it contains about the same proportion of soluble fats. Taking these facts into consideration, and notwithstanding the popular prejudice against it and the many conflicting opinions concerning it, we are forced to answer this question in the affirmative, and to state that we know of no reason why oleomargarine made from fresh, clean beef fat, obtained from healthy cattle, should not be deemed a proper and healthful article of food. How far its use shall extend is a question for the palate to decide.

We would suggest that the sale of this article be permitted in this State, but that the packages containing it be branded conspicuously with the name, and that the name of the person or company making it be also attached to the package. The public should also be informed by means of signs displayed at the places where it is sold. We would also suggest that the factories where it is made be frequently inspected by proper health officers, in order that the process may be kept under supervision and that it shall be properly conducted.

BUTTER.

In the note on oleomargarine we have described how butter is adulterated with that substance, and we may say this is the sole adulterant used in this country. It is claimed that lard and starch are added to butter, but we have never seen any specimens thus adulterated.

In butter that is improperly made we find often an excess of water, buttermilk or salt, and as these substances increase the weight they may be considered fraudulent.

CHEESE.

It is stated that arsenic, corrosive sublimate and other poisons are applied to the outside of cheese to kill parasites, and that persons have been poisoned by eating the rind of cheese so treated. We have not been able to find a single sample to substantiate this charge.

"Lard cheese" is the only fraudulent article we have found to place in the class of cheese adulteration. A patent was granted to a New York manufacturer for an improved process in cheese-making; the improvement consisting in the substitution of a foreign fat for the cream in cheese, and it enables the maker to produce cheese rich in fat from milk poor in fat.

The manufacturer states that he is able to produce from one hundred pounds of milk, four and three-quarters pounds of butter and eight pounds of cheese, by the addition of one and a half pounds of lard. The cheese has about the same amount of fat as a full cream cheese, and sells for about a cent a pound less than the latter article.

Skimmed milk is used, and to it is added about fourteen per cent. of lard—this brings it up to about the proper percentage of good milk. In the place of lard, oleomargarine has been used, but was not found to work well. This "lard cheese" industry has grown to such proportions that in New York State there are about twenty-five factories, turning out over 700 "lard cheeses" a week.

There is nothing harmful in this article, but the manufacturers should be compelled to brand the packages containing it.

MILK.

The subject of the adulteration of milk has been thoroughly gone over, and the report published in the fourth annual report of the State Board of Health, at page 209.

We can only repeat what was there said—there is no article of food that is so frequently adulterated, and of the samples to be analyzed by the Council of Analysts at least eighty per cent. will be milk. The long list of adulterants, published by authorities on this subject, cannot be verified in this State.

The only methods of sophistication that we have been able to find are the following: The addition of water, salt or sodium bicarbonate, and the abstraction of cream. We have analyzed samples containing from three per cent. up to forty-five per cent. of added water, and samples of skimmed milk that have had from five per cent. to ninety per cent. of the cream removed.

VII.—SUMMARY AS TO THE WORK OF THE COUNCIL OF ANALYSTS.

WM. H. NEWELL, M. D.

The earnest movements now on foot in Congress and in different States in favor of stringent measures to regulate the adulteration in food and drugs which exists in this country, have come none too soon when we consider the revelations that are made concerning the amount of adulteration which exists.

Traffic in this class of goods in this State has attained a condition of development which the institutions of Europe are wont to assume in this atmosphere of freedom.

Our principle of government and legislation assumes that many of minor evils of life remedy themselves, and that a tradesman who is fraudulent in his dealings will soon lose his custom, and the more scrupulous merchants in the neighborhood must thrive in consequence; whereas, the truth is, that fraud succeeds, and honesty is obliged to

close its doors. The theory that the people can take care of themselves is exploded; it has too long prevented legislation that, in other countries, has been adopted and carried out successfully. The rogue has practically his own way here. There is scarcely an article commonly used on the table, that can be guaranteed to be pure at all times.

Drugs which are pure are very costly, there being a constant demand for those which are cheap. Pharmaceutists supply the demand by furnishing goods inferior in quality, which they have purchased because they were cheap. Wholesale and retail druggists assert that they cannot pay their expenses if they keep none but pure drugs. It is not the intention of the druggist to deliberately affect in an injurious manner the public health, or to perpetrate a fraud, but he none the less has done so, and in many cases has caused the death of the patient by furnishing adulterated drugs. The different civilized nations are becoming gradually convinced that their food and drugs are adulterated in a poisonous and fraudulent manner, and to such an extent does it exist that interference is demanded and thorough investigations are being made. The European governments have long exercised restrictive measures. The German government, in 1878, had 231,478 samples of different articles analyzed, and obtained 3,352 convictions; in 1879, Great Britain analyzed 16,772 samples, 2,978 adulterations were found; 7,000 chests of adulterated tea were burned last year in British India by the government. In Paris, London, Berlin, Vienna, and in all European cities, food adulteration and traffic in substances sold for the purpose of enabling retail dealers to prepare articles which are adulterated themselves, is carried on with great secrecy and fear of the police, who are continually searching for violators of the laws which exist in those cities to prevent adulteration. In this country it is impossible for the United States government to regulate this traffic in the individual States; they must see to the proper enforcement of their own laws, and it is the duty of the New Jersey Legislature to not allow the best and most efficient law that has ever been passed by any government to prevent the adulteration of food and drugs, to become a dead letter on the statute books, on account of the want of an appropriation sufficiently large to enable our Council to carry out the law properly.

The reports of the different members of our Council exhibit a great amount of work done in the past six months in the analyza-

tion of food and drugs, chiefly for the purpose of proving, as far as possible, the class of articles sophisticated and the nature of their adulteration. Five thousand dollars would be a moderate professional charge for the amount of work done, as shown by the accompanying reports. That the actual expenses of the investigations would necessarily exceed the very limited amount appropriated for their performance, was anticipated by the Council at the beginning of their labors, as may be seen from the extract taken from the minutes of the first meeting of the Council of Analysts and Chemists of New Jersey, held at Trenton, at State House, on April 22d, 1880:

Resolved, That the amount of $500 appropriated by the Legislature for the expenses of said Council of Analysts and Chemists of State of New Jersey, is entirely inadequate to make any considerable number of chemical analyses at customary professional charges; and said Council, in carrying out the provisions of said act to their full extent, clearly recognize that in so doing they must be animated chiefly by a consideration of the importance of their labors in protecting the people of the State from the consumption of injurious and debased articles of food, drink and medicine.

REPORT OF THE MILK INSPECTOR.

WM. K. NEWTON, M. D.

I herewith transmit my second annual report to the State Board of Health.

The amended law for the prevention of the adulteration of milk, approved March 22d, 1881, is an improvement over laws previously in force, and, dealing as it does with the various methods employed for the purpose of impoverishing milk, the feeding and housing of cows, and the possible transmission of disease by means of milk, it is a very comprehensive and wise measure; but some legal technicalities in the wording need defining, before the law may be considered perfect in all its details.

Permission is given to the Inspector to appoint deputies, but as no pay is allowed for these officers, it is difficult or almost impossible to induce active men to accept the appointment. Six deputies were appointed, but, excepting Dr. Paul Radenhauser, no work was done by them without my assistance or supervision. Dr. Radenhauser, an assistant in the chemical laboratory of Stevens Institute, was appointed to aid Prof. A. R. Leeds in collecting samples in Hoboken and Jersey City. He is to be highly commended for the zeal and thoroughness with which he did his work. If the office of deputy is to be of any importance, pay must be provided for. Should the milk supply of our cities be inspected by the local health inspectors, as should be done, there will be no necessity for deputies.

The law is both a commercial and a sanitary measure, and has for its objects the protection of our dairy interests and the public health, by checking the traffic in impoverished milk; hence, it is necessary not only to have the co-operation and assistance of our local health authorities, but the health officers in adjacent States must aid us in enforcing the law. We regret very much that the local health boards in our own State, with but one exception, do nothing to aid me in my

work. In Burlington the local supply is inspected by the city Board of Health.

I have been very fortunate in enlisting the aid and co-operation of the New York Board of Health. Early in the year a conference was held with the President of that Board, Dr. Chas. F. Chandler; he not only promised all help in his power, but took a deep interest in the work.

Our thanks are due to him, and to Sanitary Inspectors Drs. White and Munsell, for many favors; working together as we did, a vast amount of good work was done.

The Brooklyn Board of Health has no system of inspection.

The Philadelphia Board of Health was appealed to for co-operation and has been notified whenever seizures were made of impure milk destined for that city. For various reasons, the authorities found it impossible to do anything, but there is a strong probability that something will be done when the Board is relieved of work it now has on hand.

To give a detailed account of my work for the year, and at the same time keep the report within proper limits, is well nigh impossible, hence I must content myself with giving a brief outline of what has been accomplished; my quarterly reports may be referred to for details.

All the important dairy sections in the State have been visited, and the milk examined either at the farms, the creameries, or the stations where it is shipped. It is with pleasure that I am able to report that the result of this system of persistent inspection is very encouraging, and that flagrant cases of adulteration are less common than heretofore.

By pursuing this method we are enabled to fix very accurately the average of a certain section or county. Thus, if we compare the milk produced in Sussex, Essex, Morris, Hunterdon, Burlington and Salem counties, we are now able to state that the milk shipped from Burlington and Salem counties is superior in quality to any in the State; Sussex county being next, Hunterdon next, while Morris and Essex would be placed lowest in the scale. Hence a standard of purity fixed on Burlington or Sussex county milk would be far too high by which to judge milk produced in Morris or Essex counties, and, *vice versa*, the average for Essex or Morris counties would be a poor one with which to compare the milk of Burlington county. The facts accumulated by system are of great value, for we can hold each section of the State responsible for its standard.

From the knowledge gained by this method, I have been able to select at a station one or two lots of milk that were below the average, and by writing to the shipper, accomplish as much as if a suit had been brought against him.

The adulteration of milk by water and the abstraction of cream—either by complete skimming or by partial removal of the cream—are very common practices among farmers, and the custom has been so prevalent that it is very hard to break it up; there is, however, a decided improvement within the past year.

The large milk depots of the Erie, the New York, Susquehanna and Western, and the Delaware, Lackawanna and Western Railroads, at Hoboken and Jersey City, have been several times visited, and over 5,000 quarts of impoverished milk have been condemned and destroyed. Repeated visits to these great distributing depots have had the effect of improving the quality of milk shipped by railroad, and the quantity of inferior skimmed milk has diminished markedly. It is gratifying to be able to quote the opinion of a gentleman who has held a prominent position having to do with the milk traffic. This gentleman says that at no time within the past six years has the milk arriving by train been of such a uniform good quality, and that the quantity of poor milk has never been so small.

The trains arrive at the stations at 12 o'clock, midnight, and to thoroughly investigate the quality of milk it requires the constant attention of the inspector from six to eight hours. An idea of the amount of work to be done may be formed when the quantity of milk brought into Jersey City is known. The Erie Railway carries about 3,600 cans, and the New York, Susquehanna and Western Railroad about 1,900. In many instances my work has been supplemented by the New York inspectors.

In July I was asked to visit Asbury Park and examine the milk brought to that place. Dr. Henry Mitchell, president of the local Health Board, was very anxious to check the sale of impoverished milk. I found, upon investigation, that about seventy-five per cent. of the supply consisted of a poor quality of skimmed milk, which contained only from two to two and a half per cent. of cream, by volume. This large quantity of impure milk was sold by one dealer. Unfortunately there was no redress under the law, for it gave the dealer permission to sell this milk from marked cans, which he did. The law, in this case, operated very harshly. Asbury Park is a popular health resort, having a floating population of from 5,000 to

10,000 people, many of whom are invalids seeking health. A large proportion of the population is composed of infants and children recovering from or sick with diarrhœal complaints, and a liberal supply of pure milk is necessary for their recovery. It is to be hoped that some means may be devised for the protection of the children, before next summer, from the evils of impure milk. Permitting the sale of this impoverished milk is simply legalized murder.

The milk supply of the following cities has been examined more or less thoroughly: Newark, Jersey City, Hoboken, Paterson, Trenton and Camden. I found that in all these cities, Trenton alone excepted, adulterated milk was sold in enormous quantities. As the local Boards of Health do nothing to check the traffic in impure milk, the dealers practiced adulteration unhindered till I made my tours of inspection. On account of lack of time and want of proper assistance it was found impossible to investigate properly the supply in the hands of the retail dealers, hence the wholesale or larger dealers were alone examined. I could complete the story by stating that I never went to a city on a tour of inspection without finding large quantities of impure milk, but as a good example of what it is in other places I will relate in detail the results of visits to a city where local inspection is completely neglected by the health authorities. I will select Newark as an example:—In the early morning of August 11th I visited that city, and, as time would permit, examined the milk as it came in by railroad or by wagon from Morris and Essex counties, with the following result: One dealer, 560 quarts on hand, all condemned as being skimmed; another dealer, 400 quarts on hand, all condemned; a wagon from Morris county, condemned 160 quarts skimmed milk and 640 quarts of milk watered from ten to forty per cent.; another wagon, 120 quarts skimmed milk, 420 quarts watered milk. Total, 2,700 quarts. Visited the city again, August 17th, and condemned 240 quarts of watered milk. Another visit September 3d: Four wholesale dealers from Morris county inspected; one dealer had 200 quarts of watered milk; another, 160 quarts; another, 280 quarts; another, 240 quarts—all watered from ten to thirty per cent. Another visit November 19th: One dealer, 120 quarts; another, 80 quarts; another, 310 quarts—all watered and all condemned.

Total amount of impure milk found in one city by four inspections, 4,330 quarts, all of which was condemned and destroyed. The supply in the hands of the retail dealers was not investigated.

The milk sold in our cities requires the constant attention of local inspectors, for it is very often adulterated.

That portion of the law permitting the sale of skimmed milk requires a word or two of comment. The object of compelling dealers to mark cans containing impoverished milk is, no doubt, to protect the public from being defrauded. But the law does not prevent fraud, for the mark on the can is rarely seen by the purchaser; when the cans are on wagons, or in stores, the label is not visible. In New York the health authorities recognize the fact that skimmed milk is a fraudulent article of merchandise, and forbid the sale, even from marked cans. Shall this State go to this extreme, and rescind the permission given to deal in the article? We have seen how much harm was done at Asbury Park. If skimmed milk is to be sold, it should not be disposed of unless the purchaser is first informed as to the quality of the article he is buying.

The various tests used to detect adulteration were very fully discussed in my article published in the report for 1880. It is hardly necessary to repeat what was there written. Since that report was published I have made many more tests and analyses, but have little to add to the statements already made.

In all cases the lactometer has been used, and tests made by this instrument have, in many instances, been followed by analyses, with the invariable result of proving the reliability of the instrument.

All that is claimed for the lactometer is that it is a proper instrument with which to test the specific gravity of milk. The objections urged against the specific gravity test are made by persons who, from personal motives, wish to mislead, or by those who do not know what is claimed for the lactometer, or by those who have not made many careful tests. One of the arguments often used by those who wish to discourage the use of the instrument, is, that it is not able to distinguish between cream and watered milk. We will grant that it may register the same when placed in cream and when used in milk reduced with water, but we will say that a person who cannot distinguish between these two articles is not competent to use the lactometer in an official capacity.

I will repeat what was said in my report of last year: The lactometer will register the specific gravity of milk. The lowest specific gravity consistent with pure milk is 1.029; hence any milk that has a lower specific gravity than that must be impure. Now, the com-

monest method of adulteration is by adding water, and the water added to milk will reduce its specific gravity, hence a lactometer, properly adjusted and properly used, will detect watering.

I base my opinion on a thorough investigation of the subject. No less than 600 specimens of pure milk have been examined by me to test the reliability of the lactometer, and I have never yet seen a specimen of pure milk with a lower specific gravity than 1.029. In fact, out of the 600 specimens tested by me, only *one* had as low a gravity as that.

The milk produced in New Jersey should show a specific gravity, when tested, of at least 1.030. In Burlington county, milk has been found to register 1.033 on the hydrometer.

This subject has been discussed by gentlemen more competent than the writer, and should any one wish to review the evidence, a full and clear account of the claims made for the lactometer may be found in the evidence in the case of the "People against Daniel Schrumpf." This case was tried in the Court of General Sessions, at New York, in December, 1876.

Unfortunately these facts have not been accepted in this State. In the great majority of cases where I have condemned milk, an analysis has been made, in case any dispute should arise.

For many months I made these analyses myself, but during the past three months the samples of condemned milk have been submitted to chemists who were disinterested parties.

Prof. A. R. Leeds and Shippen Wallace, of the Council of Analysts, have made many analyses for me. I give below a few of the results obtained upon analyzing watered milk. Some of the analyses were made by Prof. Leeds, some by Mr. Wallace, the remainder were the results obtained by myself.

ANALYSES OF WATERED MILK.

Specific gravity at 60° F.	New York Board of Health Lactometer at 60° F.	Total Solids.	Per cent. of Added Water.
1.0251	87	9.85	15
1.0249	86	9.97	16
1.0249	86	9.98	16
1.0234	81	7.97	20
1.0211	73	5.63	30
1.0237	82	6.68	20
1.0232	80	7.77	20
1.0232	80	11.39	20
1.0267	92	10.99	12
1.0287	98	12.33	5
1.0269	92	12.14	9
1.0232	80	9.57	25
1.0188	65	7.78	37
1.0261	90	11.01	12
1.0261	90	11.05	12
1.0261	90	10.92	12
1.0261	90	11.73	12
1.0240	83	10.73	18
1.0237	82	10.60	20
1.0208	72	10.22	31
1.0255	88	11.62	16
1.0261	90	12.09	12

This report has been made brief, and many important details have been omitted, but I think enough has been said to prove the necessity of a law to prevent the adulteration of milk. In my opinion, the law now in force, intended to prevent the adulteration of food, should be made so comprehensive as to take in all the important points in the milk law, and proper means should be supplied to enforce the law rigidly.

It is with great satisfaction that I am able to say that my endeavors to enforce the law have been appreciated by the people; the verdict of the public and the press has always been in my favor. No public officer can so discharge the duties of his office as to escape all adverse criticism, but I have been singularly fortunate in that my labors have been almost uniformly praised, and none have discredited my work, save those involved in the traffic of impure milk.

I am persuaded that the traffic in impure milk can be stopped if our local Boards of Health will do their share of the work and investigate the supply in the cities. Unaided, the Inspector cannot attend to all of the cities.

SECRETARY'S SUMMARY OF REPORTS

FROM LOCAL BOARDS OF HEALTH, WITH EXTRACTS AND COMMENTS.

In order to guide Local Boards as to their duties, and acquaint them with existing laws, under date of May 10th, 1881, a circular was issued, of which a copy will be found in this report under the division marked Circulars.

Early in October the usual blank was distributed to Local Boards with this circular accompanying:

CIRCULAR TO LOCAL BOARDS OF HEALTH.

TRENTON, October 1, 1881.

All Local Boards of Health need to make their annual return to the State Board o Health during the month of October.

All Boards which were constituted under the law of last year are permanently in existence. The law of itself constitutes the township committee, the assessor and the township physician, if there be such an officer, as the Board of Health for each township; and also provides as to Boards of Health in cities.

In some cases complaint is made that Local Boards do not seem to know their precise duties under the law. The general law is to be found: chapter 155 of the Laws of 1880.

On pages 272–282 of the fourth report of the Board (1880) is an explanatory circular as to the law and the duties of Health Boards. That report was sent to each assessor, as a member of the Board of Health, and for its reference and use. If in any instance any Board has failed this year to consider the health matters of its town or township it should at once be called together. It is satisfactory to know that most of the Boards realize the importance of this oversight of the public health. Some, however, take it for granted that no avoidable causes of disease exist, and by their unintentional negligence add to the sickness and to the deaths of their locality.

We ask each assessor or town clerk to state to us any failure on the part of the Local Boards.

The same blanks are furnished as those of last year.

A list of the Boards which reported last year (187 in all), is to be found on pages 119–179 of the fourth report (1880).

Boards which reported last year will not need to report the items in the schedule under A, B, E, F, G, I, L, M, N, O, P, Q, this year, unless some special new fact exists.

Under C, we ask full statements as to the sources and conditions of water supply; as to objections made to it; as to any assured or proven sickness or deterioration of the general health resulting therefrom; also, what plans of remedy are used? also, if cisterns or driven wells are used and found satisfactory? also, if filters, and if so, what kind are relied upon? Has the lowness of the streams and wells the last three months seemed to affect the quality of the water supply?

Under D, we inquire as to any natural or artificial defects in drainage, and as to any sickness attributed thereto by physicians. How has the amount of malarial fever, so-called, compared with that of last year? Are there any serious interferences with natural water-courses? Has the State law as to drainage, or the special one in addition as to the drainage of cities, been applied to any case in your section?

Under D, as to sewerage, specify what towns or parts of towns have sewers, with their size, construction, material, etc. Has the town a sanitary map, showing its underground structures, its contour, etc.? To what extent are brooks or streams made to carry sewage matter, and have any evil results been felt?

Under H, report the situation of water closets in relation to water supply and the modes of disposal of excreta, of refuse and of slop water. Also, cases in which inside water closets, or slop or kitchen sinks are connected with the outside privy vault or with cesspools. Also, as to the common mode of emptying privy vaults and cesspools.

Under J, give particulars as to diseases of animals; especially those regarded as contagious.

Under K, state whether slaughter-houses and abattoirs are situated near to private houses.

Under R, report any sanitary improvements of the past year, and any in contemplation.

Under W, add a general report as to prevalent diseases from July 1, 1880, to July 1, 1881, and make a separate noting as to any special sickness from July 1, 1881, to this date.

Assessors and town clerks in addition should personally report, as is their duty, any neglect in returns of Vital Statistics, and by whom; since the records of the last three years already show how important is exact knowledge as to the marriages, births, deaths and causes of death in each division of the State. Many other matters of importance will no doubt occur to Local Boards, on which report should be made.

We should be glad to have brought to our notice any alleged defects in existing laws. Except that defects of close study of the laws and of judicious enforcement or administration of law are not to be attributed to the laws themselves.

Indifferent attention to duty, dilatory dealing with undoubted nuisances, or promiscuous doubts where legal advice would clearly point out the methods, are not to be taken as defects of law. It is found that the calm judgment of courts and juries is against nuisances prejudicial to the public health; that present laws are applicable to such nuisances, and that where reason and persuasion will not avail, the execution of sanitary law has as good a chance of being sustained as has any other form of necessary litigation.

Let town clerks and assessors see to it that all circulars sent them are read before the Board of Health or township committee, and copies fastened in the Health Book.

By order of the Board.

E. M. HUNT, *Sec'y.*

Where laws, and duties under them, are not understood, it is generally because directions already given have been forgotten. Each Board must preserve its file of reports and circulars, and have some member who keeps himself acquainted with the existing law. There have been several additions to the Boards of last year. Reports have been duly rendered by the most of them. Here and there a Board has failed to meet, because, as in the case of school trustees, there is no provision in the law for pay for time. It was thought that health, like education, is so much a common interest, that it might, in this regard, rest on a similar basis, especially as in townships the meeting can be held the same day as that of the township committee.

The reports of many of the Boards show actual inquiry and administration. Others, that have been able to do little, are of service in educating public opinion. We have to acknowledge the faithfulness of most of the secretaries of these Boards, and the valuable aid assessors render in acquainting us with the general conditions of public health. Only abstracts of the reports are printed, and these necessarily brief. Points of local interest are sometimes omitted, although important, but as not needing the public notice of a State report. The reports of each year are carefully kept on file for reference and comparison. The reports of last year were considered of much value, and these are equally important. We ask careful attention to them, as they reveal local wants and local experience, and help others in their studies of existing evils which need abatement.

ATLANTIC COUNTY.

ABSECON, - - *Report from* JOHN T. CORDERY, *Absecon.*

The water supply is from wells. Notwithstanding the long-continued drought, there has been sufficient water, and its quality has not been changed.

There have been a few cases of cholera infantum, and at present whooping cough is prevalent.

ATLANTIC CITY, *Report from* THOMAS MCGUIRE, *Atlantic City.*

The garbage, night-soil and dish-water is handled thus: The contractor who removes the garbage is compelled to have it removed in iron carts or in sealed demijohns, and removed beyond the city limits,

which is done at present in sealed demijohns, and shipped off on the railroad to the farms in the country, and used to fertilize some of the poor lands. The night-soil is handled in the same manner. The dish-water, especially, at large hotels, heretofore has been a source of annoyance, and the Board found it to be an elephant on their hands, but at length fixed on a plan: by having a *large pit* dug, far off on the meadows and away from the streams, and boarded up tight, with a man to take care of it, so that a great annoyance is averted; but it is hard to get many to dispose of dish-water properly or live anything like clean, many very large hotels allowing it to run under the houses until the grease accumulated to the height of some feet, and became almost unbearable, until the Board found it out and made short work of it by setting a gang of men to work and digging it all out. Many others allow it to run at large until it becomes very offensive, and is very troublesome to the Board.

In addition, the report notices a hospital, costing $200, built away from other houses, for infectious cases. A copy of an ordinance, giving full powers to the Board of Health, and a model in its way, is enclosed. The Board is evidently doing good work. Some facts stated, as to cisterns and the need of greater water supply, are well and forcibly expressed.

BUENA VISTA, - - *Report from* JOHN FAUX, *Vineland.*

Measles very prevalent the last year but no deaths.

EGG HARBOR CITY, *Report from* THEODORE H. BOYSEN, M. D.

Some cases of variola occurred last winter. The first case was reported to our Board on the 5th of January, 1881; the same had been imported to this place. On the 10th another case was reported, also imported. The last case was reported to us on the 5th of March, and in the intervening period there were, in all, twenty-three cases reported; of these, five were brought to this place from elsewhere.

A notable feature of the epidemic was the large proportion of deaths which occurred.

According to the most recent statistical tables, smallpox terminates fatally about once in six cases, while of the twenty-three cases occurring in this city, eight ended fatally—more than one-third, and as many again as we should have expected. Although the number of cases is too small for comparison with extensive epidemics which occur

in large cities, yet the number of deaths seems very large in proportion to the total number of cases, and it is but natural to suppose that the extraordinary fatality of the disease must have had some definite cause.

Of the twenty-three cases reported, six were of the hæmmorhagic form, or the so-called black smallpox. By reference to a report of a smallpox hospital, we see that out of two hundred and sixteen cases of variola there treated, only two were of this fatal form.

Of our twenty-three cases, eight were never vaccinated; one case remains uncertain; five were vaccinated in youth; four were vaccinated several weeks before taking sick, and five were vaccinated before taking sick and after exposure to the disease.

In the four cases which had been vaccinated several weeks before being attacked, the result of the operation was imperfect in all; these patients all had the varioloid, or modified form of the disease.

Of the eight who had never been vaccinated, five were attacked by the hæmmorhagic, and the others with more or less severe forms of variola vera, or true smallpox.

Those who were vaccinated after exposure, and who afterwards took sick, all had varioloid.

Of the eight fatal cases, five were never vaccinated, and three had been protected years before; five had variola hæmmorhagica, two variola vera, and one varioloid; the latter was a very old man.

In the families of those who suffered with the disease there were at least thirty-five persons who had never had smallpox, and who were forced to come in contact with them; these were vaccinated after exposure, and none of them took sick.

We believe that the above figures prove conclusively that vaccination does protect. Among all the cases there is not one in which vaccination had been successfully performed within six or eight years previously.

All the cases of "black pox"—the most virulent and deadly form of the disease—occurred in persons who had never been vaccinated.

Without doubt, therefore, the great fatality of the disease in our city is owing to the fact that there are still so many people who consider vaccination as unnecessary, or who directly condemn it.

Experience has taught that the danger of inoculating vile and dangerous diseases by means of unhealthy virus is very small, and that Jenner's great discovery remains as a blessed legacy to mankind.

We would therefore urge every citizen to see to it that his children

are vaccinated before the end of the first year, and that the operation is repeated at least every six or seven years.

We would further recommend that, in case our city should ever again be visited by this dread disease, the Board of Health should be empowered to erect a hospital to which all cases could be removed. By this means much unpleasantness, inconvenience and danger could be avoided.

Several nuisances have been abated. In one respect numbers of our people have been quite careless of their health, and that is in placing privies too near to the wells—cases being seen in which they were only fifteen or twenty feet apart. The mere mention of the danger attendant upon such a state of affairs has, however, generally been sufficient to cause the abatement of the evil.

There is no inspection of houses, stables, slaughter-houses, milk or food—our authorities generally considering such precautions unnecessary. A record of vital statistics has been kept for a number of years, and vaccination was very generally enforced last winter.

In regard to pulmonary phthisis it has been observed that if a person predisposed to that affection removes to this place, and lives properly, he has a fair chance of becoming robust and healthy again; but if the disease is in an active or advanced stage, a residence in this climate is found to be very deleterious and rapidly fatal. This is probably owing to the fact that the air here is often charged with minute quantities of sea-water, which acts as a stimulant, and, where there is no active disease of the lungs, excites them to a healthy action; but where there is an inflammatory action already present, such stimulation is exaggerated into a positive irritation, and results in an extension of the inflammation.

The question has often been asked why we have no malaria, notwithstanding the fact that there are extensive swamps on all sides of us. A possible explanation may be that our soil contains a quantity of iron, which is dissolved in the water as it percolates through the same. Then, again, the water dissolves quantities of terebinthinates and tannin, which, being incompatible with the iron, are precipitated as tannates of iron, and thus form the bog iron, which remains unchanged. Decomposition of the vegetable matter does not take place, and consequently there is no possibility of the formation of bacteriæ, or minute organisms such as the medical science of the present day regards as the cause of malaria.

EGG HARBOR TP., *Report from* CONSTANT SMITH, *Steelmanville.*

There is but one slaughter-house in the township, and there is but little slaughtering done, the most of their meat being brought daily from the city of Philadelphia. There has been a large lot of garbage brought from Atlantic City on the Narrow Gauge railroad, and deposited in a gravel pit above Pleasantville, for the purpose of making compost, and getting rid of it from Atlantic City. The company in charge use carbolic acid and other ingredients to keep the stench down, but still there has been some complaint. I do not think they will be allowed to deposit there another season.

Quarantine we have none, but care is taken to prevent the spread of diseases. We had one case of smallpox, at Linwood, but the patient recovered, and no one took it. There have been several cases of typhoid fever at Linwood and two deaths, but the disease is abating. Effort is being made to put a stop to it by the physicians. Cannot account for the cause of the disease.

GALLOWAY TP., *Report from* A. E. CONOVER and Dr. G. W. ALLEN, *Oceanville.*

Our township has been remarkably, I might say *entirely*, free from malarial fever. By report of 1880, only two deaths from fever are reported, one from typhoid, one from scarlet. So far, from April 1st, not one death, from fever of any kind, has been reported. The Local Board had kept no record of statistics previous to April 1st, 1881. Since that time a record of all certificates and permits is recorded in a township record of vital statistics.

In addition, Dr. Allen notices the uniform healthfulness of the township, and its advantage in tendency to pulmonary consumption. On account of a case of smallpox many were vaccinated, and yet some opposition is manifested thereto.

HAMMONTON TP. - *Report from* M. L. JACKSON, *Hammonton.*

Three smallpox cases are reported, which recovered.

BERGEN COUNTY.

ENGLEWOOD, - *Report from* D. A. CURRIE, M. D., *Englewood.*

Natural drainage good but now needs improving, nothing having been done within the past two years, with the exception of what the

Board of Health has done. Englewood has several extended plans for future drainage, one of which we have examined. It is a growing section and needs this aid to its progress.

The Board of Health has the full confidence of its citizens, and it has a regularly drawn up code as to nuisances and their abatement, and has but little difficulty in its enforcement.

MIDLAND TP., - *Report from* JOHN G. ZABRISKIE, *Arcola.*

The water supply is good but this year deficient in quality. Some malaria along mill-ponds, accounted for by their lowness. Less than last year. Cesspools are not properly emptied. The sanitary improvements of the year have been the cleansing of wells and cisterns and the removal of a dam from a mill-pond. Some of the cases of malarial fever from the former year were very intractable. A few cases of dysentery have occurred.

PALISADE, - *Report from* I. M. SIMPSON, M. D., *Schaalenberg.*

Mild epidemics of measles and roseola are reported, also an epidemic of dysentery, which seemed to be an outcome of malarial conditions.

RIDGEWOOD, - *Report from* JOHN A. MARINUS, *Ridgewood.*

The fact is noticed that a well was found polluted from a sink drain, and was attended to by the Board. Malarial fever has not increased this year.

SADDLE RIVER, - *Report from* JOHN E. KIPP, *Paterson.*

The members of the Board have given their careful attention to a careful investigation of all matters of complaint.

The lowness of the streams and wells the last few months seems to affect the quality of the water supply and cause malaria. A great many have been affected the past year. The report shows how useful a Board can be in a country district by a careful oversight of its health interests, even when there is seldom need of active interference.

UNION TP., - - *Report from* G. R. ALYEA, *Rutherford.*

The Secretary attributes malarial diseases to the lowness of the water and its poor quality.

WASHINGTON TP., - *Report from* SCHUYLER BANTA, *Westwood.*

The report notes the continued prevalence of malarial fevers.

BURLINGTON COUNTY.

CHESTER TP., *Report from* S. C. THORNTON, M. D., *Moorestown.*

The report notices intermittent fever as ubiquitous, although mild.

CHESTERFIELD TP., *Report from* CHAS. D. LIPPINCOTT, *Crosswicks.*

Some increase of malarial fever.

LITTLE EGG HARBOR, *Report from* T. T. PRICE, M. D., *Tuckerton.*

The report gives accurate answers to the various inquiries, and reports the township as remarkably healthy.

MANSFIELD, - - *Report from* AMOS BLAKE, *Columbus.*

The sanitary improvement of the last year was the removal of a slaughter-house which had been complained of as detrimental to the public health.

NEW HANOVER TP., *Report from* GEORGE C. DAVIS, *Wrightstown.*

The water supply has been very low this year, on account of the prolonged drouth throughout the entire township. The people get their water principally from wells dug in the ground; others from cisterns, springs and ponds, forced up through leaden pipes to their dwellings. Many have had to cart their water, and drive their cattle for miles, also. In some cases sickness has been caused by the lowness of the streams, the cisterns and wells not getting their usual supply. There has been more sickness in the township with malarial fever than ever was known, and the causes are traceable to the lowness of the streams and ponds. I noticed it particularly where family residences were situated along the side of ponds that were lower than usual; they were the ones most subject to the attacks of malaria, the water becoming stagnated therefrom, throwing off its malarial poisons, thereby inoculating its victims. There have been some cases of typhoid fever in sections of the township. There has been more sickness for the year just ending than in 1880, that year being very healthy.

People in the township are awakened to the importance of having their premises in cleanliness, and of arranging apparatus in which

they can more effectually carry off the refuse, thereby promoting the welfare of the public health—the community having learned to prize that boon more than riches.

WASHINGTON TP., - *Report from* A. E. KOSTER, *Green Bank.*

More malaria than last year. Much measles and whooping cough the last year, but very little fatal sickness.

EASTHAMPTON, - *Report from* THOMAS L. SHERMAN, *Smithville.*

CAMDEN COUNTY.

CENTER TP., - *Report from* HIRAM E. BUDD, *Mt. Ephraim.*

During the past year the Board has had vaccination performed thoroughly through the township, and has removed several cases of smallpox from thickly settled sections. The report details the prompt measures adopted to prevent the spread of smallpox, several cases having occurred. The cost was about $70.

DELAWARE TP., - - *Report from* A. HILMAN, *Haddonfield.*

GLOUCESTER TP., *Report from* R. B. STEVENSON, *Blackwoodtown.*

The health of the township has been good, except the outbreak of typhus fever which occurred in the alms house of Camden county.

GLOUCESTER CITY, - *Report from* WILLIAM H. BOWKER.

The report makes special mention of the proximity of wells and privies, and of defective surface drainage. The city physicians attribute some prevalence of remittent and typhoid fevers thereto. An ordinance has been passed as to all new vaults constructed, but many of the old are not remedied.

WINSLOW TP., - *Report from* MATHIAS SIMMERMAN, *Tarsboro.*

Three cases of smallpox in March.

HADDON TP., - *Report from* J. STOKES COLES, *Haddonfield.*

The water for cooking and drinking purposes is obtained almost exclusively from common wells. So far as I know (C. H. Shivers,

township physician,) all the cases of typhoid disease in this town during the last six months have occurred in people who drank water from wells in the vicinity of a cow-yard on Grove street, which the Board of Health declared a nuisance, and had removed and renovated. The water generally is pure, especially in new sections of the borough, where there are very few stables.

The borough of Haddonfield occupies a table-land; its drainage is entirely natural and quite perfect. During the past year there has been more malarial disease than ever before, and this increase is marked at the northeast end of the town, which is surrounded, or rather bounded, by a chain of ponds; one pond (Evans') has filled up at its head very rapidly within three years, and the prolonged drouth this summer presented a seething, broiling mass to the rays of the sun. I cannot find evidence that the dry weather affected the purity of the drinking water to any great extent. I think there should be some measures taken to remedy the rapid filling up of the pond aforesaid.

Very few contagious diseases prevailed during the year. One or two cases of varioloid during the winter frightened almost every one into being vaccinated. The township physician vaccinated a number of poor children, according to law.

STOCKTON TP., - *Report from* P. W. BEALE, M. D., *Wrightsville.*

The report shows that the Board has held regular meetings, and been of much service to the township. During the year there was a marked increase of disease in the township, due partly to the severity of the winter, partly to the increased spread of malaria, and partly to the epidemic of smallpox. We have had malarial fevers to an extent before unknown in Stockton township, assuming mostly an intermittent type. Twenty cases of smallpox occurred, which were promptly attended to, houses being quarantined and fumigated, and vaccination attended to.

MERCHANTVILLE BOROUGH, - *Report from* JOHN HOMER, *Clerk.*

The report shows that the sanitary administration is good.

CAPE MAY COUNTY.

MIDDLE TP., *Report from* STILLWELL H. TOWNSEND, *Cape May C. H.*

The report forcibly shows that drainage and sewerage are too much neglected. From July to July, at periods, whooping cough, measles and roseola were prevalent, but not fatal. Only one nuisance had required the direct action of the Board.

UPPER TP., - *Report from* LEWIS D. WILLIAMS, *Tuckahoe.*

The report notices the good attention given to the records of vital statistics and to vaccination. Malarial fevers have been too common during part of the year.

CAPE MAY POINT, *Report from* D. C. GODFREY, *Cape May Point.*

The Board recognizes the importance of sanitary oversight, and looks after these interests in accord with the State law.

CUMBERLAND COUNTY.

BRIDGETON, - *Report from* CHARLES B. MOORE, *Bridgeton.*

The water supply from the East Lake water works is good, although many yet use cisterns and wells, the former chiefly for laundry purposes. Careful supervision is exercised by the Board over nuisances, and many have been abated. Diphtheria and a few cases of typhoid fever have occurred since July 1st.

DEERFIELD, - - *Report from* JOHN W. AVIS, *Deerfield.*

FAIRFIELD TP., - *Report from* JAMES M. CAMPBELL, *Fairton.*

GREENWICH, - *Report from* SAMUEL P. FITHIAN, *Greenwich.*

STOE CREEK, - *Report from* EPHRAIM MULFORD, *Roadstown.*

The disposal of excreta, refuse, slop-water, the situation of outside privy vaults, and drains from kitchen sinks, are in nearly every case bad, but as no sickness is attributed to these causes we would be considered very meddlesome to interfere. The summer just past has been

very dry and warm, with a good deal of sickness. The report notices the severity of the past winter, and the fact that the thermometer showed varying intensity of cold at the same time in localities not far from each other. We need to study climatology as varied by locality, exposure, etc., and not merely by instruments.

ESSEX COUNTY.

BLOOMFIELD TP., - *Report from* JOS. K. OAKES, *Bloomfield.*

Less malaria this last year. The Toney's brook nuisance complained of last year has been abated. The Board has closely looked after the health interests of the people. Have generally been able to secure relief without resort to law.

EAST ORANGE, - *Report from* E. M. COWDRY, *East Orange.*

LIVINGSTON, - *Report from* M. S. WILLIAMS, *Roseland.*

MILLBURN, - - *Report from* ISAIAH WILLIAMS, *Millburn.*

ORANGE CITY, - - *Report from* THEO. W. HARVEY, M. D.

I have dilated upon these small brooks, as they have for many years been the source of bad odors during the summer months, and the objects of much study on the part of the city authorities. They are regarded as private property, and not within the jurisdiction of the health authorities, and have been made the receptacle of the refuse and drainage from private houses and factories, from time immemorial. The rapid growth of the city has increased the nuisance until they have become the sewers of the city. The Board of Health has stopped the draining of cesspools and vaults into them, but they still receive the refuse from the factories, and in some instances house drainage. The only effectual remedy for this nuisance will be the introduction of an efficient system of sewers.

It is evident that the limited water-shed that furnishes the water for the plain on which Orange is situated, is no longer equal to supply the demand, and that there is not enough water poured into the soil to supply the present needs of our people.

In the neighborhood of Orange there is a low tract, through which Parrow brook flows. This section has a reputation for malaria, which

is attributed to the influence of the brook. It is very probable that the waters of the brook contain much decaying animal and vegetable matter, and that this may be one of the sources of the malarial poison, but there are, undoubtedly, other causes present. It is an interesting fact, however, that all along the borders of that stream, from the Orange line to the Passaic river, through East Orange, Bloomfield and Belleville, the various forms of disease, grouped under the term malarial, are, and have been for years, markedly prevalent.

Orange has no sewer system. This, however, is a condition that will soon be changed.

The excreta of the citizens are treated in various ways. Privy vaults, or inside water closets connecting with cesspools, or with the downward filtration system. This last system is being introduced in many premises, and is liked very much. It bore the severe test of last winter perfectly, and is, undoubtedly, the best means of disposing of house waste where there is room for it.

The hat shops are interesting from a sanitary point, as they pour their refuse and dye-stuffs into the streams; and they are injurious occupations to the employes where ventilation is not thorough, the dust causing a tendency to consumption, and the vapor of mercury inducing mercurial poisoning. The improved character of the buildings now built is shown by the decreased instances of disease to be attributed to these causes.

The Board appreciates fully the impossibility of the realization of a typical hygeia in the State of New Jersey, but they further appreciate that few citizens will care to have their lives endangered by the cultivation of causes of disease on their premises. Yet they feel that few know or realize the dangers of unsanitary conditions, and still fewer know the remedies. It is therefore the intention of the Board to educate the people in what is proper in the sanitary management of their premises; to point out the evils and the means of remedy, and to gradually bring the community into a proper state of mind regarding sanitation without shocking their ideas of the inviolability of private rights.

The Board, two years ago, established an annual inspection. Circulars were sent to each house, informing the residents of the purposes of the inspection, defining the character of nuisances, and containing the regulations of the city regarding them.

One assistant inspector was appointed in each ward, who should

inspect the premises of each citizen, and report the condition of the house, cellar, privy, cesspool and well to the Board.

This year these reports were made on a regular blank for each house, and remain on file.

Whenever a nuisance was reported, a notice was sent to the owner, requiring its abatement. These notices have been universally attended to. The inspectors make a second tour to see if the orders of the Board are carried out.

During the year 1880–81, 364 nuisances were abated. These consisted of foul and full cesspools and vaults, dirty yards, wet cellars, &c.

Through the influence of the Board, ordinances forbidding the keeping of swine in the city limits, have been passed, and another, making all cesspools and vaults water-tight, is now pending.

SOUTH ORANGE, *Report from* A. A. RANSOM, M. D., *South Orange.*

There is a dam causing the water in the east branch of Rahway river to flow back about one-half mile, receiving the drainage of the valley and part of Orange, without doubt adding to our malarial fevers sixty per cent. the last year. We are now acting through the courts, and will, without doubt, do it away. We are acting under the State law of last year. The above stream receives about one-half the sewerage of the town or village.

Have not resorted to law in any case, but persuaded and educated delinquents, and have made them good helpers.

WEST ORANGE, - *Report from* J. C. MORGAN, *Orange Valley.*

GLOUCESTER COUNTY.

FRANKLIN, - - *Report from* J. C. RICHMAN, *Malaga.*

GREENWICH TP., - *Report from* JOHN STETSON, *Paulsboro.*

Three cases of typhoid fever are stated to have occurred from waste water and slops soaking into the ground, twelve to fifteen feet from the well.

Much of the land of the township has been reclaimed by the dike and drainage system of the Mantua Drainage Company, greatly to the advantage of the township. Although this year malarial fever

has been more prevalent than usual, it is not more so along the drainage area.

A greater attention has been paid to the abatement and removal of nuisances than ever before. A slaughter-house kept in an unhealthy condition has been greatly improved under legal notice and inspection.

GLASSBORO TP., - *Report from* JOHN E. PIERCE, *Glassboro.*

The report alludes to the abatement of a drain nuisance, and to the prevalence of malarial diseases in the district.

MONROE TP., - *Report from* D. L. DAWSON, *Williamstown.*

Complaint is made of the nuisance arising from hog-pens near to the public streets, and of the refuse of a canning factory allowed to lay near the road; also of the unkempt condition of streets. The report, read alongside that of similar rural districts, shows that the Board of Health, by judicious action, could do much, even if they expended no more than the fifty dollars now authorized as a bill against the township for sanitary improvement.

MANTUA TP., - - *Report from* B. A. CARSON, *Mantua.*

The water supply is good for house use, as it is used from wells and pumps. Great Mantua creek runs along the edge of the village, and on account of the weather being so hot and dry, with very little or no rains to carry off the rotten refuse of tide-water creeks, has caused considerable malarial fever; nearly the whole village has been more or less affected; one family lost four members by the disease; this was the worst case. The health of the town is improving. The general complaint now in Mantua township is chills and fever.

WEST DEPTFORD, - - *Report from* JAMES M. WILKINS.

Malarial diseases have prevailed since August first.

WOODBURY, - - *Report from* R. S. CLYMER, *Woodbury.*

The report shows intelligent comprehension of the needs of sanitary administration and its judicious exercise. The outbreak of smallpox was properly limited by vaccination. There were only five cases, none fatal.

WOOLWICH TP., - *Report from* DANIEL LIPPINCOTT, *Swedesboro.*

Some malarial disease, but otherwise a season of health.

HUDSON COUNTY.

KEARNEY TP., - - *Report from* S. W. CLASON, *Arlington.*

The water supply is, as heretofore, cisterns and driven wells. These have been found inadequate during the dry season, but no steps have been taken to remedy it. Some diarrhœa troubles resulted from the extreme lowness of water.

The drainage is, as last year, defective, nothing having been done. The accursed cesspool being the principal means, which consists, in most cases, of a hole in the ground, filled with stones, or stoned up in some cases and covered over. Arlington has a small drain pipe running through one street and discharging in an open drain in lower part of village, and continues in open drain some five hundred feet before entering a little stream which is supposed to carry it off to meadows below. The sewer pipe at commencement is six inches; at ending about twelve inches. This sewer is never flushed except by an overflow of cisterns, with which it is generally connected as well as the sinks of the respective houses. We need radical changes in this.

There being few wells, have heard of no contamination of any kind. A few inside water-closets are connected to cesspools, which are discharged, by means of pumps, upon the soil; frequently privy vaults are emptied by means of excavating companies. Slop water disposed of by cesspools and sewer, as stated under drainage.

No diseases of animals reported or coming under my knowledge.

Slaughter-houses are not situated near private residences, still we suffer considerably from offensive odors when wind blows to us from their direction. It has been thought to abate them through the State Board of Health.

JERSEY CITY, - - - *Report from* D. W. BENJAMIN.

NORTH BERGEN TP., - *Report from* GEO. BRUCE, *New Durham.*

WEST HOBOKEN, - *Report from* WM. G. SMITH, *West Hoboken.*

UNION TP., - *Report from* JOHN MCGRANE, *Town of Union.*

HUNTERDON COUNTY.

FRANKLIN TP., *Report from* CHARLES M. TRIMMER, *Quakertown.*

HIGH BRIDGE, - *Report from* SAMUEL P. LUNGER, *High Bridge.*

KINGWOOD, - - - *Report from* H. P. SHAW, *Kingwood.*

The drought affected the quantity of water supply. Along the river shore there were many cases of malarial fever. There was much whooping cough in early spring. Measles prevailed extensively in May, June and July.

LEBANON, - - *Report from* A. S. BANGHART, *Glen Gardner.*

There has been less prevalence of typhoid and malarial fevers than the former year.

FLEMINGTON, - *Report from* CHARLES W. HOFF, *Flemington.*

The water supply has been changed, and is now from the south branch of the Raritan river.

The mode of delivery of refuse, through pipes into small streams, will answer only while a city is small. A suggestion is made, that in towns a general law should prevent the erection of slaughter-houses near dwellings.

CLINTON (Borough), - *Report from* H. ALTEMUS, *Clinton.*

Malarial fever has been less prevalent than last year.

WEST AMWELL, *Report from* GEO. H. LARISON, M. D., *Lambertville.*

The year has been one of unusual good health. The report complains that local Boards are not sufficiently aided in their important work, and are too much limited both as to power and pecuniary provisions.

CHAMBERSBURG, - - *Report from* S. D. SOUTH, *Trenton.*

The soil of Chambersburg and its more recent growth, makes its conditions for health more favorable than those of Trenton. Care is taken to remove refuse matter and to prevent contamination of the soil. It is greatly to the interest of the borough to maintain an efficient health inspection, and so prevent evils which will otherwise occur.

EAST WINDSOR, - *Report from* A. A. WRIGHT, *Hightstown.*

HAMILTON TP., *Report from* JOSEPH H. WEST, Assessor, *Hamilton Square.*

One death from smallpox is reported, but active vaccination prevented its spreading.

PRINCETON (Borough), *Report from* Prof. J. S. SCHENCK, *Princeton.*

A water company has recently been formed, and it is believed before many months our supply through street mains will be abundant and of the best quality.

A much more general attention to and interest in sanitary matters than formerly.

Statistics fully attended to. Monthly returns forwarded regularly to Secretary of State.

Within the year the Board of Health ordered a general vaccination, at the expense of the borough, of such as were unable to pay for themselves. About 250 were vaccinated under this order.

No case of smallpox has occurred within the year.

TRENTON, - - - - JOHN WOOLVERTON, M. D.

In absence of full reports, we quote as follows from the message of the mayor, Hon. G. D. W. Vroom:

Paramount among the matters to which your attention will be called, must stand the health and cleanliness of the city. At no time has it been necessary to use more forcible language, or to lay before you more urgent recommendations. * * * I am not asserting too much, I trust, in maintaining that too little attention has heretofore been given to this subject. The dread of increasing our bonded indebtedness has prevented even the most essential improvements in the sewage of the city. Laudable as a spirit of economy undoubtedly is, it ceases to be so when its consequences are baneful to the general health. We have no system of sanitary inspection whatever. Save during the summer months, the Board of Health exercises no supervision, and the condition of sinks and cesspools is left entirely to the option of the citizen. Ordinances of the common council prohibiting the pollution of certain streams are openly and notoriously violated. Streams running through populous parts of the city are thus, in direct violation of law, used as sewers. The race-way of the Trenton Water

Power Company is made the receptacle for hundreds of out-houses, and during the hot season, the water being necessarily low and very frequently drawn off entirely, pestilential malaria is the inevitable result. I am informed that the condition of this water-course caused the utmost astonishment to the gentlemen, experts in sanitary matters, who lately visited our city, at the request of council, for the purpose of recommending a plan for sewering our city. I call the attention of the common council to the existence of these evils with all earnestness. I shall endeavor, if in my power, to cause the ordinances to be enforced, but I must rely upon your cordial co-operation and assistance. The ordinance establishing the Board of Health should be revised and made to conform to the decision of the Supreme Court in the Marshall Case. The court there held that where a business was not *per se* a nuisance, power was not vested in the Board of Health, nor could it be delegated to it by council, to determine whether an occupation, lawful in itself, is so conducted as to become liable to abatement. The common council, under the charter, has this power, and the ordinance must be so amended as to define what circumstances of abuse will render such occupation obnoxious, and thereupon liable to abatement. These amendments in the ordinance should be made before the unhealthy season sets in. With the ordinance as it stands at present, the power of the Board is very limited. I would also recommend that this ordinance be further amended by creating the office of Health Inspector. The work of the Board cannot be effectively done by the police force or the street commissioner. It is essential that there should be an officer connected with the Board whose whole time shall be at its service.

Last year an appropriation of $1,000 was made by the common council for the purpose of procuring a map of the city, and, through experts, to obtain a plan, based upon the said map, for sewering the entire city. No part of this sum has yet been expended. The city surveyor should be directed to proceed at once with the preparation of this map, and when completed the plan of sewerage should be adopted, after the examination of the views of those qualified by scientific research and experience to make the proper recommendations. The day has passed, I trust, when permission shall be granted to use the public streets for the purpose of placing therein sinks and cesspools. West State street for a whole block is fairly honeycombed with them. Constructed as they are, without means of ventilation,

there is no escape for the noxious gases save through the pipes communicating with the dwellings. The very fact that this practice of so using the streets exists, calls loudly for the adoption of some plan, at an early day, for the abatement of such an evil.

WASHINGTON, - *Report from* JOHN B. YARD, *Robbinsville.*

A few cases of smallpox and one death therefrom are reported.

HIGHTSTOWN (Borough), - - *Report from* W. W. SWETT.

The report is a careful statement of facts as to undrained land and improper emptying of sewage, and while no results are fully proven, interference with drainage and imperfect methods of refuse removal are sure to record their accumulated results.

MIDDLESEX COUNTY.

MONROE TP., - *Report from* ELIAS D. APPLEGATE, *Cranbury.*

NEW BRUNSWICK (City), - *Report from* Prof. D. T. REILEY.

It has been a season not marked by any special epidemic influences, still the city has suffered severely from the prevalence of certain ailments which should never have occurred.

About only one-third of the city has been sewered (there are about twenty miles of streets and only six and one-half miles of sewers), and this (as noticed in our last report) is of such a defective character that it may well be questioned whether it is not a source of disease rather than a sanitary safeguard. We believe that the emptying of excreta into slack water must ultimately result in the production of disease of dangerous form. The remaining two-thirds of the city is without any proper drainage, the inhabitants emptying their slop-water into the gutters, and the excreta being received by privies, the contents of which percolate through the soil and poison the surrounding wells. The Board of Health would call attention to the condition of our streets, which are never clean, and which in summer are deluged by badly constructed sprinklers, rendering them muddy, and enabling the summer sun to liberate the gases from decaying offal, which must be detrimental to the public health. Our public schools are generally

well ventilated and properly constructed, but are the agents for spreading the communicable diseases of childhood, and should have more stringent regulations regarding the admission of children coming from infected households. In other words, the standard of attendance is held so high that often children are admitted to the schools who should be at home under the care of their parents and medical attendance rather than commingling with their fellows.

Our public health laws are sadly defective; we have but little power to carry out sanitary measures, and great difficulty in enforcing penalties clearly within our jurisdiction. In common with a large portion of the county, we have suffered in a greater degree than usual from malarial tendencies—this substratum of influence showing itself in various maladies. In the early part of this report reference was made to the existence of sickness which should have never occurred, and under this head may be mentioned the prevalence of a number of cases of typhoid fever. Within a limited locality twenty-three cases of typhoid fever existed, nineteen of which could be traced to drinking water from a pump, situated on the corner of Oliver and Nelson streets—this pump is contiguous to a graveyard, say within fifty or sixty feet. But a more potent influence, perhaps, was the existence of three cases of typhoid fever last winter in the immediate proximity, the dip of the shale favoring the percolation of typhoid matter from the out-houses situated near to the pump above referred to. Besides these cases, three cases of typhoid fever have recently arisen near the sewer basin, at the corner of George and Albany streets, from which an insupportable stench is frequently noticed.

Another instance of disease occurring within our city, which might have been largely prevented, was the existence of smallpox. During the month of March, 1881, two cases of varioloid existed at 22 Richmond street. The inmates of the house were promptly vaccinated and a vigorous quarantine enforced, and it proceeded no further, until, in the month of June, a son of Mrs. Moore, living on Washington street, was taken with smallpox (contracted elsewhere). Dr. Shannon immediately vaccinated the family, but the mother refused to comply with simplest sanitary regulations, and from this neglect a number of cases rapidly arose, so that there occurred in all forty-nine cases and nine deaths. These cases cannot be all properly charged to the above neglect, but the refusal to allow the use of disinfectants in a single instance largely aided in fostering the disease. Through the liberality

of common council the city physician was enabled to practice vaccination on a large number of the indigent poor, 735 having received this protection. The Board feel called upon to call attention to the character of the material used for vaccination, which was in all instances from the so-called bovine virus. Many of the sores produced by this agent lacked the typical character of the true vaccine pustule, a raspberry-looking vesicle taking the place of the proper manifestation.

The refuse which accumulates in the streets is removed and deposited in designated places within its limits, for filling up of low places, *once* a week, in carts for that purpose. The excreta is removed from the city in casks, or tight, box wagons, when required by individuals, or by order of the health officer, on complaint; dead animals are removed from the city limits by permit.

The diseases of animals have been through the year of a mild and ordinary character, with the exception of a few cases of splenic fever.

An ordinance giving the Board of Health greater powers in the control of disease prevalent, epidemic or endemic, has been passed during the past year by the common council. The invitation of the State Board of Health to criticise the present general law is timely. We think that the 1st section is faulty in not fixing a time for the exit of the members of the Board. The phraseology is, "not less than three years," but the maximum service is without limit. The provision for penalties in the 8th section is impracticable in most cities, because it is dilatory and indirect. The Board of Health must assume responsibility, pecuniary and legal, besides incurring immediate expense in the expectation of ultimate compensation.

There should be some legislation, marking out distinctly the control which should and can be exercised over the streets by the Board of Health.

During the year the inspector has investigated 44 complaints, made 50 inspections and issued 319 permits. In a number of inspections a committee from the Board, in company with the commissioners of streets and sewers, have inspected together the condition of lots and streets in different parts of the city. In every case of smallpox reported to the inspector, he has visited the house and given instructions as to sanitary precautions to be used, has attended to the removal of patients, and superintended the burial of the dead.

PERTH AMBOY, - - - *Report from* C. L. PARKER.

The water supply has heretofore been by means of wells and cisterns, but we have taken a new departure in the introduction of water under the direction of a water company, the fire-plugs and pipes having been introduced through all the streets and many houses, and water will be turned on during this month.

The sewerage and draining facilities are improving. We have now three parallel or main sewers emptying into the sound, with several connecting ones and private drains running through the streets.

The garbage question is as troublesome with us as in most places. Though the city has contracted for the prompt removal of all garbage, ashes and other filth, the contractor is indifferent to his duties, and the authorities unwilling to enforce the carrying out of the contract.

Privy vaults are generally in a very wretched condition, especially in the old buildings and localities. They are usually full to overflowing, and in some localities the stench arising therefrom is almost unbearable as you pass along the streets.

Public health laws are good enough, but very poorly enforced.

The registration of vital statistics is complete and in good working order.

PISCATAWAY TP., - *Report from* NATHAN VARS, *Dunellen.*

The extreme drouth of the past autumn completely dried up many streams which scarcely ever fail, and in many, if not most sections of the township, these, heretofore considered living streams, have furnished little or no water, and now, December 15th, many of them show but little effect of the abundant rains of the last few weeks.

This condition of affairs seems to have been the cause of more inconvenience than sickness, as the fall has been more than usually free from fevers, and but little opportunity has been afforded physicians to ply the healing art.

In contrast with the fall, the summer was marked by an unusual prevalence of diseases, caused or affected by the malarial influences which seemed to manifest themselves throughout the whole country, while at the same time there was a less tendency to bowel ailments, diarrhœa, dysentery and cholera infantum than usual, especially when we consider the great heat of the summer months.

No epidemics have prevailed. There were two instances, one in Dunellen and another in its immediate vicinity, of evidences of diph-

theria contagion, but it seemed difficult to trace it to its source, and the disease was controlled and did not spread beyond two families, in which it originated, in one of which two out of three, and in the other five out of nine cases proved fatal.

A considerable attention has been given to vaccination, but no cases of smallpox have been observed.

I forgot to call attention to the circular issued by the Board last spring to the inhabitants of our township, one of which I enclose. I think its distribution has been of benefit to our township, and has saved the Health Board from work which otherwise they would have been compelled to do. Some few complaints have been made to the Board, but no official action has been necessary.

BOARD OF HEALTH,
TOWNSHIP OF PISCATAWAY.

Your attention is respectfully invited to the action of the Board of Health of Piscataway township, designed to secure the enforcement of proper sanitary measures, to protect, so far as possible, the health of the people of the township, as exhibited in the following circular:

WHEREAS, Malarial diseases were extensively prevalent during the past season, and there being indications that in the coming one the same experiences may be realized; and

WHEREAS, It is believed that these diseases are promoted by, and largely the result of, allowing improper and offensive matter to accumulate on and around our premises, and that the removal of all such material would greatly mitigate, if not entirely eradicate, those diseases;

Therefore, The Board of Health of Piscataway township respectfully request of you, as of every other householder, that you take immediate measures to remove from your premises any and all impure, unhealthy or decaying matter (if such can be found), taking especial care to cleanse any and all privies, cesspools, vaults, &c., and to disinfect them when necessary, and also to secure as perfect drainage of your premises as is possible; and the Board indulge the hope that a due regard for the welfare of yourself and family, as well as of the public generally, will prompt you to accord a speedy and cheerful compliance with this (as it seems to us) very reasonable request; and that a general compliance on the part of all will save the Board the ofttimes unpleasant duty of special action in individual cases.

And, further, While the Board would not encourage complaints of a trivial character, yet under the law making it their duty to abate nuisances and enforce sanitary regulations, all real causes of offence must of necessity command their attention.

NATHAN VARS, *President*,
PISCATAWAY, May 2d, 1881. A. S. TITSWORTH, *Secretary*.

SOUTH AMBOY, - *Report from* A. V. APPLEGATE, *South Amboy*.

Vaccination has been well attended to. A few cases of diphtheria are reported.

WOODBRIDGE, - *Report from* S. E. FREEMAN, M. D., *Woodbridge.*

We have in the township some low, swampy places, where the water has no natural outlet, is stagnant, and becomes a fruitful source of malarial fever. There was much of it last year, and about the same this year.

One small stream has been made to carry the sewage from several houses standing near it, and likewise the contents of the privies belonging to said houses. Several cases of fever the past season have been attributed thereto.

MONMOUTH COUNTY.

ASBURY PARK, - - *Report from* HENRY MITCHELL, M. D.

During the past year the sewerage system of this borough has been much extended, until at present about nine miles of street mains are in place—all in operation. The general plan of sewerage has been found to be efficient.

The introduction of a public water supply, which it was hoped would be accomplished before this date, has not yet been effected, but a company (the "Neptune Water Works Company") is organized, and immediate steps promise now to be taken to secure the introduction of water.

The streets and public grounds in the borough are kept in a cleanly and healthful condition. Some effort on the part of this Board has been necessary to prevent the deposit in the streets of filthy liquids, &c., but our rule governing that matter is now generally known and observed.

Privy vaults and cesspools which are still unconnected with street sewers are excavated by means of the odorless excavating apparatus, and no difficulty nor any objection is found or offered to this operation. We confidently hope that the day is not distant when no cesspools will exist within our district. From the privy vaults we have little to fear, for all of them are required to be of brick and cement, and to be made water-tight.

Garbage is daily gathered by carts, and carried beyond our limits, so that the borough suffers no inconvenience from this source. But some of the garbage is taken a short distance back into the country

and fed to swine, causing the pens and fields in which it is deposited to be offensive, and rendering the vicinity unhealthful. Garbage gathered by the public carts is all taken to freshly-dug pits and covered with earth. The swine feeding is carried on by individuals who collect the garbage in their own wagons. We deem it essential to the health of neighboring localities that this use of garbage be prevented.

The school buildings in the borough have been frequently inspected during the year, and suggestions have been made as occasion required. The public school building is at present overcrowded, the average number of pupils attending daily being 454, while the total seating capacity is but 426. The total number enrolled is 558.

In January, 1881, free vaccination was offered to all indigent persons, and during January, February and March 259 persons were vaccinated. All primary cases were successful, so far as heard from, and no serious result occurred in any case. Bovine virus was employed.

During the summer several cases of scarlet fever occurred in this district. Isolation, as far as practicable, was secured for those cases which could not be removed. One case was sent to our hospital, outside of the borough limits. No other contagious disease has existed within the borough during the past year. We receive weekly school reports of all pupils who are absent on account of sickness, and require reports from physicians of all cases of contagious diseases which they may professionally attend.

The plan of houses and house inspection has been kept up during the summer months, and all premises found in an unsanitary condition have been required to conform to our ordinances.

Early in the summer our attention was called to the fact that much adulterated milk was being brought into and sold within the borough. Evidence of the fact was obtained by the aid of Dr. William K. Newton, State Inspector of Milk, and in one case the milk was poured upon the ground. Evidence in other cases was presented to the grand jury, but no indictment was found. We have, however, received from the milk dealers an assurance that no milk will hereafter be offered for sale except that obtained from sources approved by the State Inspector of Milk.

Some arrests have been made, and in a few instances fines have been imposed, for violations of our ordinances, but, as a rule, little opposition has been met with in carrying on our work.

EATONTOWN, - - *Report from* ABRAM S. METZAR, *Eatontown.*

The defective drainage of Eatontown is complained of. Mill brook is impeded in its course by willows, rubbish, &c., and to this interference with a natural water-course is attributed the extensive and wide-spread malarial fever that has been universal in this vicinity and in Ocean Port. If we would keep our coast clear from malarial invasion, we must preserve the natural drainage, and add artificial drainage to make up for the changes which population introduces.

FREEHOLD TP., - - *Report from* S. E. THOMPSON, *Freehold.*

It is noticed that the entrance doors of schools, etc., open inward, so as to be dangerous in case of fire.

Vital statistics will be more fully tabulated the next year, and an attempt be made to separate those in the incorporated limits from the rest of the township. The Board has just been arranging its work, and is confident that by another year a more complete and satisfactory report can be made.

FREEHOLD VILLAGE, *Report from* CHAS. F. RICHARDSON, *Freehold.*

The Board of Health of the borough or corporation of Freehold, in the township of Freehold, county of Monmouth, would respectfully submit this, their second annual report.

Though apparently ignored in the annual report of your Board, we feel confident that we were not remiss in any of the duties laid upon us from our appointment by the town commissioners, but have faithfully investigated every complaint, whether verbal or written, made to us, and have cured or remedied the causes of complaint.

From general report, we say that the health of our town has been very good. There have been some rumored cases of malarial fever scattered in different parts of the town, but the question is an open one, from the fact that malaria is now commonly denominated the cause of the majority of "ills that flesh is heir to."

An artificial pond on one side of the town, constructed several years ago, for protection against fire, was thought by some to be injurious to the public health and a developer of mosquitoes. A feeling being worked up against it, the Board examined into the matter and could not honestly condemn it. But, in compliance with the vote of the town, it was drained and discontinued without any visible improvement in the troubles alleged to be caused by it.

In view of the spread of smallpox in the cities within easy communication with us, the Board, last spring, prepared a circular, recommending vaccination, which circular was delivered to every householder, and we believe there were a large number who were vaccinated in accordance with our suggestions.

HOLMDEL TP., - *Report from* H. D. HENDRICKSON, *Hazlet.*

There has been, since July 1st, an increase of malarial diseases over last year.

HOWELL TP., - *Report from* S. S. GARRISON, *Lower Squankum.*

MANALAPAN TP., - - *Report from* L. D. BUGBEE, *Tennent.*

MATAWAN TP., - - *Report from* BENJ. GRIGGS, *Matawan.*

Malarial fevers have been less by one-half than last year. In one case there has been removal of obstructions to natural drainage.

MILLSTONE, - - *Report from* PETER FORMAN, *Manalapan.*

This report we subjoin in full as showing a diligent oversight of the health interests of the township, in a district which has but little sickness to report. We commend it to the notice of the Boards of rural districts, some of which see nothing to prevent, because no diligent attention is exercised.

During the year the Board, by active inquiry and observation, have endeavored to procure all the information possible in regard to the sanitary condition of the people, and are able to report that they have not found it necessary in any instance to institute any formal proceedings in order to discharge the duties incumbent upon them, the few minor cases of nuisance and irregularity which have come to their knowledge, having been promptly abated upon a simple verbal request made by the Board. The favorable sanitary condition of the people is mainly attributed to the general elevated and dry situation of our soil and climate, the absence of any town, village, or considerable number of congregated dwellings in our territory, and the simple and rural habits of the people.

Notwithstanding the protracted drouths of the past summer, but little difficulty has been experienced with the water supply; our natural streams and springs, and the wells at each farm-house and

dwelling, having generally met all demands; cistern water is used in many places, but never for culinary or drinking purposes.

There have been some cases of malarial fever, probably a slight increase in number since last year, but not attributable, in the opinion of the Board, to any faulty sanitary condition here, as a careful inquiry reveals the fact that most of the cases have been brought to us by persons who have been residing or sojourning in other localities. There is no regular system of drainage or sewerage, and the water-closets and cesspools we believe as a rule are situated so that there is but little danger of contamination to the water supply, being generally located in some private and remote corner of the premises. No doubt, however, some reform and improvement could be suggested in this and all other agricultural communities in regard to the management of the water-closets, kitchen, sinks, cesspools, &c., found in every farm-house and country dwelling, too often showing plainly the want of proper care and cleanliness on the part of the owners.

In regard to the registration of vital statistics, this Board has endeavored to keep a faithful record of all returns for their own guidance, use and comparison since their organization, but have experienced great difficulty in making the record complete, on account of ministers, physicians and undertakers residing in other townships making return to their own local Boards which are due here, causing us much additional labor and inquiry to ascertain if proper return has been made in each case according to the statute; besides impairing the value of our record for want of completeness. We, therefore, respectfully represent that, in our opinion, some rule or enactment to remedy such remissness would tend greatly to the advantage of the whole system.

SHREWSBURY TP., *Report from* RICHARD A. SICKLES, *Red Bank.*

The water has been very low in the wells, and many of them are dry. Malarial fever has made its appearance where it never was known before, and is supposed to be caused by the impure state of the water.

RED BANK, - - *Report from* HENRY J. CHILD, *Red Bank.*

The commissioners have under consideration the question of water supply. Two companies have bid for the privilege of supplying the town, one from a reservoir, the other from a standing pipe. Up to this date the contract has not been awarded to either.

The natural fall of the ground both sides of the town towards the river, forms the best chance for good drainage, with as little expense, as any town in the State.

Last year was the first appearance of malaria in this section of country. It appeared this year to be of a worse type, and many more cases.

We have one covered drain built of brick, about three feet in diameter, for surface drainage, running from the front street to river, about 500 or 600 feet. It is a worse nuisance to the inhabitants than no drain, for when the wind is from the river it draws up it, and the stench is very bad.

The common mode of emptying privy vaults is by means of a steam pump connected by a hose to a barrel, the suction pipe in the vault, and as one barrel is filled another is put in its place. In these barrels it is carted out on the farms, and used as a fertilizer. Refuse slop water has numerous ways for its disposal.

KEYPORT, - - *Report from* S. V. ARROWSMITH, *Keyport.*

A marsh in the central part of the town having been regarded as inducive of malarial disorders, has been drained during the past year at the expense of the town. Malarial affections have been less prevalent and milder than last year. We have asked an ordinance compelling cemented vaults for privies.

MORRIS COUNTY.

CHATHAM, - - *Report from* B. D. GRISWOLD, *Madison.*

During the summer months fever and ague and other diseases of a malarial character were more prevalent than during the previous year, owing in part to the drouth and the poorer quality of water used in consequence thereof, as there is no water supply other than that from wells and cisterns, the majority of which were empty for some weeks.

The report notices that odors from slaughter-houses, ponds and foul water pipes were more noticeable than usual during the dry season.

JEFFERSON TP., - *Report from* AMZI L. WEAVER, *Oak Ridge.*

The most sickness we have had has been at Hurdtown mines near Lake Lopatcong. We think it is caused by the Morris Canal Com-

pany. The upper end near Hurdtown has been flowed over for three miles, and at this time of the year it is drawn down very low. The place has always been noted for fever and ague. The Board has inspected the buildings at Hurdtown, and they have tried to clean up all the rubbish, but it does not appear to do any good. Vaccination is being more fully attended to.

MENDHAM, - - - - *Report from* J. R. PITNEY.

We have no malarial disease this year.

MORRISTOWN, - *Report from* J. C. LINDSLY, M. D., *Morristown.*

The water supply is excellent.

The privy system is miserable. Several small streams running through the town are made public sewers, to the detriment of those living near them.

Intermittent and remittent fevers have prevailed more than for many years past. This is believed to be due to some ponds and streams. Into one of these the sewage of the asylum is discharged without proper filtration.

MT. OLIVE TP., - - *Report from* J. B. KING, *Stanhope.*

The emptying of excreta and slop-water into Budd's lake from any of the hotels is of doubtful propriety. Chills and fever have been somewhat prevalent this year.

ROXBURY TP., *Report from* JOHN T. LAWRENCE, *McCainesville.*

Chills and fever have abounded.

DOVER, - - - - *Report from* WM. H. LAMBERT.

Driven wells have served a good purpose the present year.

OCEAN COUNTY.

BERKELEY, - - - *Report from* H. WILLIAMS, *Bayville.*

JACKSON, - - *Report from* THOMAS P. BISHOP, *Cassville.*

LACY TP., - *Report from* CHAS. H. STULTS, *Forked River.*

Diphtheria made its appearance here about the first of May, and about the time when the burning of charcoal ceased. It seems to be

a fact that while the coaling business is in progress there is very little sickness. It is noted that as the burning of charcoal commenced in August, diphtheria ceased; the only sickness now is chills and fever, brought by watermen from the South, who come here to get well. During the summer months there were several cases of a disease resembling hay fever.

STAFFORD TP., *Report from* WM. H. FLUMERFELT, *Manahawken.*

PASSAIC COUNTY.

ACQUACKANOCK TP., - *Report from* N. FREDERICKS, *Passaic.*

There has been a lessening of malarial fever the past year.

MANCHESTER, - *Report from* JOHN VAN HOUTEN, *Paterson.*

Driven wells have not been a success. Cisterns are much used and generally have filters. In the past year there has been some filling up and draining of low spots where water would stand and vegetable matter collect and decay. There is, also, in contemplation, an artificial pond, of which the dam has been torn away, leaving several small pools. Malarial fevers occur, but not so frequently as last year.

PASSAIC CITY, - - - *Report from* F. H. RICO, M. D.

Our wells, owing to the character of the soil, are easily contaminated.

Malarial fevers are not near so prevalent as last year.

There were several cases of smallpox in the spring. Vaccination was generally performed and the cases successfully quarantined.

WAYNE TP., - - *Report from* R. M. TORBET, *Paterson.*

The only natural defect in drainage is caused by the rocky reef in the Passaic river, above Little Falls, which, in times of high water, backs it up in the Singack brook and Pompton river, overflowing a large part of the southern end of the township, and to this some attribute the malarial fevers.

In hilly townships, like ours, where the general health is good, there seems but little for the Board of Health to do. We think the law a good one and its provisions ample, though there may be town-

ships which will not require to have all its provisions go into effect for years to come.

WEST MILFORD, - *Report from* A. TERHUNE, *West Milford.*

We have naturally a healthy township and, if water companies do not dam up our lakes for reservoirs, there is no reason why it should not remain so.

SALEM COUNTY.

LOWER ALLOWAYS, *Report from* EPHRAIM CARLE, *Harmersville.*

Less of malarial fever and general healthfulness.

MANNINGTON TP., - - *Report from* DAVID GRIER, *Salem.*

PILEGROVE, - *Report from* J. M. C. RICHARDSON, *Woodstown.*

SALEM (City), - - *Report from* JOS. M. BACON, *Salem.*

The building of water works is nearly completed. Ditches, carrying water to streams, have been cleansed.

The city has employed a physician to attend to vaccination.

UPPER PITTSGROVE, - - *Report from* HENRY COOMBS, *Elmer.*

Action has been taken to have children vaccinated.

SOMERSET COUNTY.

BEDMINSTER TP., - *Report from* WM. P. SUTPHEN, *Bedminster.*

We are almost free from malarial fevers.

There has been a more general use made of the contents of privy vaults by converting it into night-soil by the application of lime, ashes and earth.

At each meeting of the township committee the health book has been presented, and any matter relating to this Board properly canvassed. Consequently no special expense has been incurred by the Board.

HILLSBOROUGH, - *Report from* C. R. P. FISHER, M. D., *Neshanic.*

At the annual meeting of the Board, March 14th, 1881, the circular of the State Board, as to vaccination, was directed to be sent to

each district clerk. There have been a few isolated cases of diphtheria, and malarial diseases have markedly increased, although we know of no especial cause.

FRANKLIN TP., - *Report from* D. J. VOORHEES, *East Millstone.*

We have been called together twice for special service the last year. Malarial fevers exist to some extent, but are not on the increase. Ministers and physicians are not particular enough to make vital returns in the township in which the event recorded occurs.

MONTGOMERY TP., - - *Report from* WM. OPPIE, *Harlingen.*

The assessor has canvassed the township carefully in the interests of health.

There have been a few slight cases of malaria bordering on the Millstone river and the Delaware & Raritan canal.

NORTH PLAINFIELD, - *Report from* ISAAC BROKAW, *Plainfield.*

An outbreak of smallpox was circumscribed by active measures, vaccination, etc., and cost about $245 to the township.

WARREN TP., - - *Report from* JAMES RALPH, *Warrenville.*

Some cases of malarial disease are reported.

SUSSEX COUNTY.

BYRAM TP., - *Report from* C. F. COCHRAN, M. D., *Stanhope.*

Malarial diseases have been on the increase. The law as to unregistered practitioners was inquired into by the Board on account of some irregularities affecting the health of the community.

GREEN TP., - - *Report from* JOB J. DECKER, *Andover.*

MONTAGUE TP., - - *Report from* JOSHUA COLE, *Montague.*

Malarial disease has diminished since last year.

NEWTON TP., - - *Report from* GEORGE HARDIN, *Newton.*

STILLWATER TP., - *Report from* C. V. MOORE, M. D., *Stillwater.*

One-third of the wells have been dry.

There was much sickness of a malarial type at a small village on the borders of the township.

UNION COUNTY.

CLARK TP., - - - *Report from* WM. J. THOMPSON.

Our Board supervises all matters relating to health, and has acted promptly in cases brought to their notice.

CRANFORD TP., - *Report from* GIDEON E. LUDLOW, *Crawford.*

The Board asks for a milk inspector, fully empowered, to be provided by the State.

FANWOOD TP., *Report from* T. H. WESTCOTT, M. D., *Scotch Plains.*

There have been some cases of malignant scarlet fever, and of follicular pharyngitis. The Board has looked after vaccination.

LINDEN TP., - *Report from* JOHN A. ETHERIDGE, *Linden.*

The report shows good attention on the part of the Board. There has been a diminution of malarial diseases. In one instance an old cesspool in a garden, covered over by planks, was discovered. In cleaning it out the owner of the property contracted typhoid fever and died.

NEW PROVIDENCE, - *Report from* JOHN WOOD, *New Providence.*

Our town is generally healthy. Two stagnant ponds have annoyed us some, but are under control.

PLAINFIELD, - - - *Report from* H. C. LOWRIE, M. D.

Water supply derived entirely from open and driven wells—quality excellent. A great many *open* wells have failed during the past three or four months. No driven wells have given out. No cisterns are used, and no filters. Have had no diseases arising from impure water.

An epidemic seldom invades the city, but at such times the sick are carefully quarantined. We had a few (5) cases of variola and

varioloid last February; they were carefully isolated by the city physician, and not a single case of contagion resulted. The *five cases all were* produced by a traveling person convalescent. The city council then ordered general vaccination.

The gravel pits which were partially filled year before last, have remained in a perfectly healthy condition, and will so continue.

The Randolph mill-pond, bounding the city on the west, has been remedied. The dam was destroyed by freshet in February, 1881, and the owners *were not* allowed to rebuild it. The flats on either side of the channel were leveled, and seeded with oats and grass seed, and in the summer an abundant crop was mown. Now the pond is in a very fair condition for health.

RAHWAY.

The Board is more efficient than formerly.

Malarial fever has occurred much during this year, but mostly of mild type. Smallpox has caused much anxiety. A detailed account, abbreviated from that of the health physician, is appended.

Case I.—Mrs. Desterway, aged twenty-seven years, taken sick on October 23d, died on October 28th of malignant or hemorrhagic smallpox. It was at first said case occurred from clothing sent from Jersey City, but this is false, as the clothes (only clothing she ever received) were sent to her nearly two years ago; had been made up and worn out by the children. She had not been out of city of Rahway for two years. The only clue that I can get at is that about two weeks before she was taken sick a crazy woman, an acquaintance, visited her and spent the day; she came from Newark, and it is said that she was complaining of feeling sick. That evening she left the city and I cannot find out where she went to. Mrs. D. had not been vaccinated since she was a child. This case was treated as typhoid-malaria, and the neighbors all visited her, and, as she was a poor woman, helped nurse her. She had a public funeral, but undertaker Ryno, believing it to be smallpox, had the coffin closed.

Case II.—James Corso, aged twenty-seven years, brother-in-law to first patient; had helped to nurse her, and frequently handled her; was taken sick, and after being treated for about a week for typhoid-malaria, his physician called Dr. James, who, having some doubt as to diagnosis, sent for Dr. Janeway, of New York. On consultation it was pronounced a case of hemorrhagic smallpox. Had been vaccin-

ated once. After about a week's illness he died. The case in its symptoms was evidently obscure.

On November 2d, during the time that Corso was sick, one of Mrs. Desterway's children, Carrie, aged two years, never vaccinated, died of congestion of brain; probably due to undeveloped smallpox; the same day, November 2d, Mrs. Desterway's two other children, aged four and eight, were also seized with the disease; never vaccinated; confluent variety; two last recovered. These children, after the death of their mother, were all taken to Mrs. Marsh's house (sister of Mrs. Desterway's). On November 5th, Mrs. Marsh was taken sick with the disease, of a distinct variety, coming on about nine days after exposure; had been vaccinated once when young; the other inmates of house, five in number, were vaccinated; all took, and have escaped except one child of Mrs. Marsh's, aged two years; had been vaccinated five times; never took until this last time; has distinct smallpox. All these cases were confined to one house and all got well.

Mrs. W., aged about twenty-eight years, vaccinated when a child, sat up with Mrs. Desterway two nights; taken sick November 5th; distinct variety; husband and cousin in house; both re-vaccinated and have escaped disease.

Miss B., aged about twenty-four years, vaccinated when infant, exposed to first case, confluent variety; taken sick, confluent variety, November 4th; brother's baby, in same house, taken sick same day; aged about eighteen months; vaccinated three times and never took; Mrs. B., mother of Miss B., taken sick with varioloid about 28th of November; vaccinated three times; took twice, last about twenty years ago.

Mr. Crowell, aged about thirty-five, occupied part of house with first case (Mrs. Desterway); taken about November 5th; had been vaccinated when young; confluent variety. Mrs. C., his wife, aged about thirty, taken sick about three days after exposed to first case; vaccinated when child; distinct variety.

Mrs. High, aged sixty-three years, vaccinated when young and at breaking out of the disease; vaccination did not take; taken sick November 16th; died November 20th; hemorrhagic smallpox.

A case occurred October 28th, or thereabout, of varioloid, in another part of the city—Mrs. Mary O'Connell, a resident of New York; a friend of hers had died of smallpox at her house in New York; she came here for fear of being sent to hospital; had no new cases from this; returned to New York well.

The above cases were all confined to seven houses. With the exception of the four cases of death, they have all recovered, and if no new cases show themselves within a few days, will be entirely rid of it in that section of the city. Our method of dealing with them has been to place a large card on the houses with "smallpox" on it; do not allow any one to visit the inmates, nor any one from within to go on the street; we have had all unnecessary furniture removed from the sick room; we furnish them with all the disinfectants they can use (we furnish it so that they will use it freely)—lime, carbolic acid, &c.; after the case is reported, have all the rooms, clothing and closets in the house fumigated with sulphur; furniture that has remained in room first scrubbed; walls whitewashed, &c.; have a man stationed in the neighborhood, who does all their errands, so that they have no need to go into the streets; burn the bed and bedding; bury all cloths, &c., used during sickness; allow them to wash sheets, &c., if they soak for twenty-four hours in solution of acid carbolic and zinci sulphate first. The percentage of vaccinations that took, as near as I can find out, has been about seventy per cent. Some of us had as high as ninety per cent. take, some less. Several physicians among them have been surprised at the number of successful secondary vaccinations. The matter used has been bovine, most of it obtained from the health officer, New York city. A new case of a colored child proves to be smallpox. Don't know how she got it, unless from a dress waist bought from a ragman. Three or four other cases are reported, but the epidemic has ceased.

This outline is printed with the report because of the obscurity of the first cases; the occurrence of smallpox in cases that had apparently been vaccinated; the frequency with which revaccination succeeded, and the efficient measures used to check the disease. There are various explanations of some of these facts, and while none show the inefficiency of vaccination, they do show that we need to know what genuine vaccinations are, and to have all the facts in evidence before we arrive at a conclusion.

SPRINGFIELD, - *Report from* W. C. JOBS, M. D., *Springfield.*

During the months of August and September the malarial fevers were not as prevalent as in October. During that latter month the record of cases was larger than in the same month for the previous six years, and more numerous than in any other month of the present

year. The increase of the frequency of the fever, though generally of a mild type, was attributed to the dirty and scanty supply of the water both in the wells and springs.

SUMMIT, - - - *Report from* GEO. W. NICHOLS, *Summit.*

The water from the driven wells is peculiarly obnoxious, owing, probably, to the near presence of imperfect privy vaults. Complaints are frequent, and the owners of the property have promised to comply with the regulations of the Board.

There are several deep ravines in the township, some of which, supplied from springs, are natural water-courses, from which some families draw their water supply. Several privy vaults and cesspools empty their overflow upon the sides of the ravines, creating not only noxious effluvia, but, by entrance into the streams, contaminate the water, and render its use exceedingly dangerous for either culinary or cleansing purposes.

The Board has had several meetings with prominent citizens, and the subjects of drainage, sewerage, etc., and the best means of destroying malarial conditions, have been fully discussed.

It is hoped the mass of the people may be soon aroused to the importance of guarding against the accumulation of septic conditions, and that the people, at our next town meeting, will appropriate an amount of sufficient magnitude to enable the Board to report a greater advance toward the purpose of its creation.

WESTFIELD TP., - *Report from* JOHN M. C. MARSH, *Westfield.*

We have suffered considerably during the past summer for want of water. A large number of the wells giving out entirely, and the two natural water-courses or brooks running through our village drying up, our water supply came chiefly from dug or driven wells. The driven or tube well is found to give perfect satisfaction, both in quantity and quality of the water.

We have no system of drainage in our village. The surface water is drained into the two brooks running through the village. There has been no interference with the natural water-courses. The State law as to drainage has not been applied in any case the past year. The town has no sanitary map.

There are no water-closets in close proximity to the wells in our town. The inside water-closets and kitchen sinks are connected with

cesspools, situate some distance from dwellings, by iron or earthen pipes. The privy vaults and cesspools are emptied during the cold weather by being bailed out into carts, prepared for the purpose by some of our farmers, and the contents are used for fertilizing purposes.

The physicians, ministers and undertakers have been very prompt in making their returns of vital statistics to the assessor.

Our town has no quarantine establishment for patients sick with contagious diseases. We have had but two cases of smallpox, occurring last May, both in the same house. The house was immediately quarantined and looked after by the Board of Health. Neither case resulted fatally, and it did not spread to any other person in our village.

The Board has been to an expense of over $75 the past year for sanitary purposes.

WARREN COUNTY.

ALLAMUCHY, - *Report from* WILLIAM M. SEALS, *Hackettstown.*

The general health very good. No contagious diseases of animals, except five or six cases of hydrophobia.

FRELINGHUYSEN, - *Report from* JOHN H. WARD, *Johnsonsburgh.*

Malarial fever has been steadily abating the last three or four years, and is full seventy-five per cent. less.

HACKETTSTOWN, *Report from* JOHN S. COOK, M. D., *Hackettstown.*

Public health not attended to until organization of Board of Health. Since that date nuisances have been abated, and successful efforts have been made to remove every cause of detriment to the health of the community. There is one source of malaria, and, as the Board believe, a prolific one, which they have not succeeded in removing, viz., a pond or slough, situated on the east side of the town, built for the furnishing of water power to a foundry, erected some forty years since. Upon investigation, it was found that the original pond was almost filled with mud and decaying vegetable matter, so as to render the amount of water contained in it totally inadequate to serve the purpose for which it was originally intended, and that it only required the running of the machinery for a few hours in the morning to ex-

haust the supply, and to leave a large surface exposed to the action of the sun during the remainder of the day. As the stream furnishing the supply is a small one, the filling-up process is a very slow one. And then, in addition to all this, two slaughter-houses were in operation at the head of the pond, with their offal and waste material running into the stream. These were soon removed, and efforts were made to secure the co-operation of the town council to remove the pond and drain the land, in order to save delay and the expense incident to its removal through the provision made by statute. In this the Board have so far failed, and, instead, have been compelled to combat an opposition. We have to wait, that public opinion may be influenced and brought to bear more favorably upon the project of removing so prolific a source of malaria, and which must be a great detriment to the well-being and good name of our town.

The statement thus made should certainly attract the attention of all interested in the town. While owners should not be expected to make too great sacrifices, no town can afford to sustain disease factories.

HARMONY, - - *Report from* JOHN K. VANNATTA, *Harmony*.

In some cases where wells have been driven we have found the water, when very low, to emit a bad smell, but can give no cause for it as it is fed from a spring at a depth of say twenty-five or thirty feet. We have traced no bad effects therefrom as yet.

With regard to the disposal of excreta, it is the same primitive way. A privy is constructed some distance from the dwelling, and we have heard no complaint since we last wrote your honorable Board. There were two or three instances where we had to visit and enforce the regulations, as laid down with regard to its disposal, and it has been modified as far as practicable.

The diseases which have been prevalent may be summarized from the returns which we have sent in, as there is no physician connected with this Board. From July 1st to this date we have to note, very recently, that diphtheria has visited us very severely. There are six or seven families now suffering from it within the radius of a mile. The place is 1,200 feet high from the sea level, and was always considered the most healthy portion of the mountain. The houses are all clean, healthy and well built, and the inhabitants are well-to-do farmers.

A subject worthy of note is that near to some of their houses is bog or marsh land, which in rainy seasons is very wet and not drained, and this season being dry, the exhalations arising therefrom might, no no doubt, contain the germs of disease. In one family, father, mother and five children have been attacked, and one child has died from its effects.

LOPATCONG, - - - *Report from* J. YIESLEY, *Phillipsburg.*

Decrease of malarial fevers.

MANSFIELD, - - *Report from* WM. H. MOWDER, *Anderson.*

OXFORD, - - - - *Report from* HENRY MYERS, *Oxford.*

WASHINGTON, - - *Report from* JOHN SHERRER, *New Hampton.*

These abstracts, necessarily brief, show how much can be done by efficient Boards, and how little can be done by such as are inefficient. There are assessors who have so acquainted themselves with the pressing health needs of their townships, and who have come to be such good advisers as to the avoidance of nuisances, as to be of much service in the suggestions they make and the defects they point out. Law is not simply mandatory, and often does much good because it gives force to advice which might otherwise be overlooked.

The reports show that malarial diseases still prevail too extensively, and that they are associated with the conditions of undrained land and vegetable decay. Smallpox has occurred at many points in the State. The records, as made in Egg Harbor City, New Brunswick, Rahway, Stockton township, Camden county, and other places, deserve attention. We urge upon Local Boards close examination of this condensed summary, and efforts at local health improvements.

ANIMALS AS RELATED TO HUMAN DISEASE, AND TO THE CARE OF PUBLIC HEALTH.

E. M. HUNT, M.D.

It is the glory of sanitary science and art that it attempts to define what are the conditions under which mankind can be best sustained in health. This merely means that it is an attempt to find out what there is abnormal or unnatural in the individual, or what there is abnormal or unnatural in his surroundings, so that the two can be put in the intended relations favorable to health. It assumes that originally the author of both made no mistake in the adaptation of the one to the other. So soon as physics, as a practical study, came to have a fund of knowledge which told what are the requirements of the natural man, and what are the natural relations of air, earth, food and water and all his surroundings to him, so soon it was practicable to study and designate the deviations, with a view to their rectification. It was soon apparent that these deviations are interferences which result in imperfect health, except so far as they are remedied, or as there is compensation therefor or adjustment thereto. Thus the prevention of disease soon certified itself as more fundamental than its cure. As disease so much saps the life of society and disturbs the welfare of the State, and as many of the evils are the direct result of the infringement of one upon another, government came to recognize that it belonged to its concern in all those particulars in which the individual must look for his protection to the effectiveness of sanitary police—to the law which regulates the duties of men to each other as adjoining citizens.

But it was not long before it found itself compelled to go a step further. Man is but one among the many species of animals that inhabit the earth. These are a part of life. Life in its high human form is very dependent upon life in its lower forms. The latter may imperil the former by appropriating too much of the common aliment

of air or food or water, or by the befoulment arising from secretions, and by the transfer of its diseases to mankind; or, since it has food relations, by the character of the food which it furnishes for our consumption.

Therefore, the study of animals, as related to the public health, cannot be left out of the question. "It is," says Dr. Greenfield, "by the study of comparative pathology that we have come to learn how intimately the processes of disease in the lower animals may resemble those in man, and it is by experiments upon the diseases which they have in common with man, that we have come to appreciate those differences in constitution and in reaction to disease, which enable us in a great measure to control the results of experiments.

"Comparative pathology, that is, the study of the diseases of the several classes of animals, and the study of the same disease in its reactions upon different classes of animals, is to a very large extent a growth of late years.

"It is true that a study of diseases of animals has been to some extent conjoined with the study of comparative anatomy and physiology, and that Harvey, Hunter and Jenner were well aware of the valuable information to be derived from a comparison of human with animal pathology. It was well known that some of the lower animals were subject to certain morbid growths and parasites analogous to those wh'ch afflict man, such as warts, cancers and hydatids, and that some animal diseases, such as hydrophobia, could be communicated by inoculation to man; and long before Edward Jenner discovered that cowpox could be transferred to man, it was suspected that smallpox was primarily an animal disease.

"But we have only recently come to understand the full bearing of those endemics and pestilences which have in all ages desolated the animal world, and to see that we stand on common ground with the brute creation in being subject to the same or to analogous plagues, and that by the study of these, under their simpler conditions, we may hope to throw light upon the forms affecting man. It is in this branch of comparative pathology—that relating to infectious and contagious diseases—that we see best the value and importance of experimental pathology, in the direct benefits which it confers on the whole brute creation, as well as upon man, and it is in this field that have been gained some of the most remarkable triumphs of modern pathology, which bid fair to revolutionize the science and treatment of infectious diseases."

Even before this point was reached, the welfare of animals had come to be considered, because disease among them so largely affected commercial interests and financial prosperity. Both of these points render the subject worthy of State and national attention. We seek only brief notice of some of these particulars in which the condition of animals affects public health.

I. As animals, like ourselves, consume air, the crowding of them together deteriorates air. For this reason, not only because of the evil effect on the animals, but because of the additional demands made upon the common stock of the atmosphere, and its contamination, we should estimate this closeness and avoid it.

II. The secretions of animals are, many of them, injurious to the public health, and, as such, they largely and rapidly add to the accumulation of offensive organic matter.

For both these reasons the close keeping of animals, and the disposition made of the refuse, must in all cities be closely under the inspection of the sanitary police. Animals are also too often kept so near to isolated country houses as to befoul the atmosphere, to taint the water or to add too largely to heaps of decaying matter.

III. Many diseases of animals are directly communicable to man. Not less than ten diseases are thus recognized.

While the inoculability and fatal communication of hydrophobia and glanders are well known, it is not so generally known that anthrax or malignant pustule, smallpox, Asiatic cholera and diphtheria, are thus communicable.

As a specimen of some of the facts in evidence, we refer to the article on the "Transmissibility of Diphtheria from Animals to Mankind," in the *Veterinary Journal* of September, 1881, by Fleming, of the British army veterinary service. There is much reason to believe that thus domestic animals, such as the cat or dog, not only convey a disease as would a garment, but that they transmit it as does one person to another.

According to Gamgee, "foot and mouth disease is a contagious eruptive fever, affecting all warm-blooded animals, and attacking man under certain circumstances as readily as any of our domestic quadrupeds." Vacher says the strong presumption is that it can be caused by the ingestion of the meat of the affected animals.

There is too much reason to suppose that erysipelas and carbuncles or boils often occur from infected meat or milk. That anthrax, both in

the form of splenic fever and malignant pustule, is communicable from animals to man, does not admit of doubt.

The communication of tuberculosis or consumption, both by the milk and flesh of cattle, is now attracting much attention. In 1865 M. Villemin, and after him Dr. Tappeiner, showed the inoculability of tubercle. So high an authority as Klebs asserts, "that by inoculating calves with human tubercle, he has produced the characteristic pearly eruptions of the bovine disease," thus showing its identity with what is known as the pearl disease of cows. In 1869, Gerlach, of Hanover, had showed how the flesh, as food, would convey this form of it from animal to animal. Chaveau, Klebs and Gerlach are of those who claim the identity of the human and bovine tuberculosis. It is found that about five per cent. of the cattle are affected with tuberculosis, and that a genuine consumption can be produced in sheep, swine, rabbits and dogs by inoculation. Still more directly, Dr. Creighton, of Cambridge, in his book on "Bovine Tuberculosis in Man," and in his paper before the International Medical Congress in London (1881), seems to show that the bovine disease is conveyed to man by the flesh and milk of animals. It is claimed that the high mortality among infants fed on cows' milk is to some degree owing to its specific effect in producing tuberculosis in the lungs, or the same disease, in the form of a marasmus, in the mesenteric glands. Prof. Law, of Cornell University, has given some cases of consumption which seem traceable to tuberculous cows. Tubercle is frequently found in the lungs of cattle, especially those that have been kept in close sheds, and are not allowed sufficient air space.

Even where no disease is induced which is directly transmissible to man, the deterioration in the quality of the flesh cannot but deprive it of its highest value as a food, and thus make its nutrition less.

Still more serious is the result when it is remembered that milk enters so largely into consideration as a food. In experiments made upon milk it is not difficult to discover that there is very much milk of inferior quality, not because of admixture after procurement, but because it is a secretion from animals so unnaturally kept as to cause a sad substitute for that fluid, which, in its best state, furnishes, in right proportion, all the ingredients which are to be found in a perfect aliment.

The paper of Ernest Hart, before the International Medical Congress (1880), says: "The three diseases which have as yet been recognized as capable of being spread by milk, are typhoid fever,

scarlatina and diphtheria. There is nothing in the analogy of epidemics to limit the list permanently to these; and already there are indications of other cognate diseases being spread by the same agency. The number of epidemics of typhoid fever, recorded in the abstract as due to milk, is fifty; of scarlatina, fourteen, and of diphtheria, seven. The total number of cases traced to the drinking of infected milk, occurring during the epidemics, may be reckoned in round numbers as 3,500 of typhoid fever, 800 of scarlatina, and 500 of diphtheria."

Mr. Francis Vacher, medical officer of health, Birkenhead, says: "There is abundant evidence in support of the view that foot and mouth disease might be spread to the human subject by means of milk."

Prof. Fleming also said to us that he was suspicious as to the flesh having caused the disease in some cases. This apthous disorder is among the most serious of cattle pests, and, as it does not dry up the milk, is fraught with great risks to human kind.

Recently some new facts have been stated by Dr. Brush, in respect of the evils resulting from milk of cows freshly calved, when used for infants.

A proper meat and milk supply is so essential to the health of the people that inspection should be considered essential. The milk and meat of swill-fed and stabled cows needs constant watching in order to guard us from imperfect food. No one can see the way in which the milk business is conducted, or examine some of the foul pens of our cities, without realizing that, in the interests of health, all such places should be subject to inspection by the sanitary authorities. One of the advantages of public abattoirs is that a meat inspector can be at hand to reject meats plainly unfit for food. Such tests as are known and available help much in protecting the public from those impositions which are as prejudicial to the health as they are to the pockets of purchasers.

IV. Parasitic diseases are often originated in or conveyed by animals. There are twenty-two parasites common to men and to animals, some of which are known to originate only in animals.

Several of the skin diseases thus have their origin.

What we know of the trichina spiralis is enough to illustrate those parasites which invade tissues or organs beneath the skin. This parasite is harbored in swine and in its "asexual" form encysts itself in the muscles of the pig. When the raw or half-cooked meat is eaten, digestion disposes of the cysts and liberates their contents. Thus

liberated from the cyst, the trichina come to their mature sexual period and are capable of procreation toward the third day. Besides the irritation by liberation from the cyst, and also of its juices, "in less than five days some of the embryos are born." "One trichina may give birth to a couple of thousand of embryos." Over 85,000 have been found in a cubic inch of human muscle. See Glazier's Report.

The dread of the disease and its fatality is such that, although not very many cases can be traced to an American source, it has greatly effected the demand for American pork in British and European markets. There are other injurious parasites, the history and the mode of conveyance of which from animals to men needs to be well understood and guarded against. As in many other instances, prevention is not difficult, but after the invasion has occurred, the swarming progeny cannot be removed. Often lingering sickness follows, until the higher and stronger life, outdone by the millions of the lesser life, succumbs to the force of numbers.

The feeding, too, of uncooked meats to animals is believed to give rise to many parasitic and other diseases. Dr. Baker, of Michigan, in a recent report as to hog cholera, says that "the disease is probably spread very largely by mice, rats and cats which die and lie around unobserved, and to which chickens and hogs have access."

The prevalence of diseases among animals is sure to place on the market much inferior, if not diseased food, and the great losses from destruction and burial increase the price of good meats, and so cause a poorer and dearer supply for the working classes.

Statistics carefully secured show that the United States, in one year, lost from pneumo-enteritis, or hog cholera, $20,000,000. The losses from rinderpest and contagious pleuro-pneumonia in some foreign countries have been far beyond this. Diseases such as these, to which are to be added Texas fever, usually regarded as splenic fever, foot and mouth disease, and sheep rot, and so-called chicken cholera, have made much havoc with our meat supply. The interests of public health require exact attention to these weighty concerns, in order that diseases may not be propagated, and that bad meat may not come into our markets, and that the price of good meat may not, by scarcity, be so increased as to cause a more restricted diet.

VI. A study of the diseases of animals has thrown, and is throwing, much light upon the contagions which are destructive to them. The following language of an editorial, in a recent number of the

Veterinary Journal, London, only says what is fully felt by medical men whose studies have been in this direction:

"The recent advance made in the study of the pathology of certain transmissible and very fatal diseases of animals, opens up a new line of research and experimentation, and revolutionizes to a startling degree our notions as to the nature and etiology of these maladies, but still more so, perhaps, our views with regard to their prevention—at least in their most deadly form. It is true that protective inoculation has been, during many years, more or less successfully practiced for the contagious pleuro-pneumonia of cattle, and under conditions which, while it prevented animals being attacked with the disorder, rendered it comparatively innocuous, so far as injury to health was concerned. The discovery of microscopical organisms in anthrax, and the experiments which clearly demonstrated that they were the active agents in producing the disease, had, however, a wonderful result for pathology and preventive medicine. Pasteur, whose previous researches on the silk worm disease and fermentation had done so much in this direction, has led the van, in conjunction with our professional colleagues, Professors Chauveau and Toussaint, in defining the conditions upon which protective inoculation may be most effectively and safely resorted to, in several of the scourges of animals, and particularly so in the so-called fowl cholera and anthrax. From the results already acquired, there can scarcely remain any doubt that in the laboratory the germs of these diseases can be so cultivated that their virulency is all but destroyed; so that when inoculated in healthy creatures they scarcely produce any perceptible disturbance, though they insure immunity from a future attack of the deadly germs. This artificial cultivation or attenuation of the virus of destructive disorders, so that by inoculation with it these no longer need be feared, is a subject fraught with the deepest importance, not only to animal but to human medicine, and is only second in point of value to the discovery of means by which the germs of disease can be completely and totally annihilated.

"In veterinary science especially must it command earnest attention. Already this kind of inoculation is being largely practiced for mitigating the ravages occasioned by anthrax or splenic fever among the flocks in France, and in Belgium it appears to be successfully employed in contagious pleuro-pneumonia. In our own empire we have terrible diseases which should be easily brought under control in the same manner. In India we have the cattle plague, (indeed, it constantly

prevails throughout Asia,) sheep-pox, Loodianah disease or anthrax, and other similar disorders, and in South Africa we have that most destructive of equine plagues, the horse sickness—inoculable and anthracoid in its nature—which sweeps off all the horses from entire districts in a single season, and contagious pleuro-pneumonia, destroying the cattle without let or hindrance, from the seaboard to Central Africa, while the same malady prevails almost unchecked in Australia. Then there is swine plague, a disease inoculable, and due to a particular germ, which in Europe and America threatens to ultimately exterminate the porcine species. Surely the startling laboratory discoveries of the last few years can be applied on a grand scale, in general practice, in order to bring the long list of animal plagues completely within the power of man, and so get rid of all the anxiety, loss, danger and embarrassment to nations which their presence ever occasions! Not many years ago the microscope in veterinary medicine was sneered at as a silly toy. Without this wonderful instrument pathology, and even surgery, would have made but little progress, while the science of preventive medicine would scarcely have existed; every day it is throwing light on hitherto obscure subjects. We hope and trust that the great expectations raised as to the further application of the germ theory to the transmissible diseases of animals may be fully realized. It is a grand conception, and the result is already a great victory for the scientists, who are sometimes stigmatized by the so-called practical men as 'theorists.'

"Whether by the direct introduction into the blood of very small quantities of virus, as practiced by Chauveau, or by inoculation with cultivated or specially modified virus, as carried out by Pasteur and Toussaint, a brilliant prospect is opened out for our future dealings with veritable scourges, and for this we are indebted to the microscope, no less than to experimental pathology."

To see how rapidly practical results follow, in reference to anthrax or splenic fever, so dreaded here, we have only to refer to some of the words of M. Pasteur, in his recent address in London:

"In France we lose every year by splenic fever animals of the value of 20,000,000f. I was asked to give a public demonstration of the results already mentioned. This experiment I may relate in a few words. Fifty sheep were placed at my disposition, of which twenty-five were vaccinated. A fortnight afterward the fifty sheep were inoculated with the most virulent anthrocoid microbe. The twenty-five vaccinated sheep resisted the infection; the twenty-five unvaccin-

ated sheep died of splenic fever within fifty hours. Since that time my energies have been taxed to meet the demands of farmers for supplies of this vaccine. In the space of fifteen days we have vaccinated in the departments surrounding Paris more than 20,000 sheep, and a large number of cattle and horses. If I were not pressed for time I should bring to your notice two other kinds of virus attenuated by similar means. These experiments will be communicated by-and-by to the public."

Previous to this we had long regarded the facts as to inoculation for pleuro-pneumonia among the most interesting and suggestive in the range of preventive treatment. The fact that, by introducing juice from the diseased lung into the tail of the animal, a local and yet protective disease can be produced, and even limited in more general effects by the removal of the tail after swelling has occurred, indicated a control of disease which will yet have more extended application.

VII. It is easy to see how directly such experiments and such results bear upon the prevention of human diseases.

Dr. Samuel Wilkes, president of the section of pathology at the recent International Medical Congress, said, "a true human pathology should have its basis in comparative pathology." The resemblances in the effects of disease poisons, and in morbid changes, has been abundantly shown in experimentations upon animals, to which we have been indebted for most important knowledge in human treatment.

The eighteen years of study by Jenner of the phenomena of vaccina, or cowpox, and its successful application as a preventive of smallpox, is illustrated in another direction.

The twenty-five years of labor of Pasteur, aided by those of Burdon-Sanderson, Touissaint, Dr. Greenfield, Dr. Buchner, Koch, Chauveau, Grawitz and others, have opened up a field of inquiry as to many specific diseases in human kind, and led to the hope that we shall yet be able so to dilute and modify certain poisons, such as those of diphtheria, scarlet fever, &c., so as to render the system unsusceptible to serious attack. If we could transfer the face and manner of this eloquent and laborious scientist to paper, we could show how much he knew and how much he meant when he said, "the method is one the fruitfulness of which inspires me with boundless anticipations."

It is not the mere fact that preventive inoculation is already established as a means of limiting contagion among animals, or the question whether it shall not yet become applicable in many of the diseases

to which mankind is subject. Experimentation upon animals, and close watchfulness of symptoms and lesions, and of the causes and courses of disease, has already had such results as to justify the hope that we shall yet have more light break forth in the interests of humanity. Advances in comparative anatomy, comparative physiology and comparative pathology are now being followed by an advance in comparative therapeutics and treatment, especially in systems of prevention applicable in a degree to us as well as to other animals. These are but some of the many reasons that commend a study of the diseases of animals, not only to the attention of physicians, but also make attention to them obligatory upon the State, and upon all those who would aid in the limitation and prevention of disease, in the interest of the citizen, and for both the health, protection and pecuniary welfare of the masses.

CIRCULARS AND LAWS SINCE JANUARY 1, 1881.

CIRCULAR AS TO SMALLPOX.

TRENTON, February 21st, 1881.

The State Board of Health has evidence of the existence of smallpox in scattered localities in this State, as well as in the cities of New York and Philadelphia. The epidemic as existing in Camden long since, upon the invitation of the local authorities received our attention, and vigorous measures were instituted by them. But now, from other sources, scattered cases have occurred in other towns and in rural districts, until it may easily become a wide-spread epidemic. Four or five cases occurring in Trenton have already disbanded the Normal School. (1881.)

The right of school trustees to require vaccination in order to attendance at school in times of epidemic, or else to prohibit attendance, is not questioned. By the terms of the Health Laws of March 11th, 1880, all school boards are authorized to vaccinate at public expense, any pupils attending school who are unable to procure vaccination.

All Local Health Boards need to see to it that vaccination is recommended, as well as rapid isolation of cases secured, if any occur. The cost of local epidemics of smallpox is very great, besides the risks to life and public health. The prevention of the disease is within the range and duty of your control. All our Local Health Boards and school boards should co-operate in influence and provision for more general vaccination, and for revaccination of persons who have not been vaccinated since full growth. The heads of large manufacturing establishments need to attend to it, both in the interest of capital and labor. Trenton has set a good example in making the means therefor accessible.

Most of our physicians have full confidence in humanized vaccine virus, which is easily secured. *Vaccine virus directly from the animal*

is preferred by those who have any fear of communication of other diseases through humanized lymph—a fear that is greatly magnified in the popular mind. It is, nevertheless, due that all have their preference, and that where vaccination is insisted upon as a condition of school attendance, bovine virus be used if desired. Many physicians prefer to use this. The New York City Board of Health, 301 Mott street, New York, furnishes it daily by mail. H. A. Martin & Son send it direct from their herd, Roxbury Station, Boston, Mass. Dr. E. L. Griffin, Fond du Lac, Wis., is prompt in remittal from his vaccine farm. Ready supplies can also be had from Philadelphia and other cities. The price per point is about twenty cents, and less in larger quantities. It can often be had from local druggists. There is reason to believe that much is sold for bovine virus which is not such, and that there is a failure in effect because of age and imperfect keeping.

We urge upon all physicians great exactness in selecting virus, and upon the people protection from the disease. Its outbreak every few years is not a proof of epidemic tendency. The periodicity rather occurs because that after an epidemic, as soon as years enough have passed for a younger product of children to be out in public child-life, this susceptible material becomes so abundant as to insure extension if a single case is introduced from another section. Then there is an outbreak of smallpox and of vaccination. Would it not be better if, somehow, the young population could be systematically protected? Let our various communities and the Local Boards now secure this, not only under present threatenings, but also as a wise preventive measure.

Copies of this circular will be sent more fully on application by postal to State Board of Health, Trenton, and any inquiries be promptly answered.

SMALLPOX CIRCULAR, NO. 2.

January, 1882.

The smallpox epidemic existing in the United States has affected about twenty-five localities in this State. Camden and Jersey City have been the points from which it has chiefly been spread. With the present facilities for travel and the thoroughfare character of this State, there is no reasonable expectancy that any person will reach the age of twenty-one without an attack of smallpox, unless the dis-

ease is prevented by vaccination. The person who runs the risk, not only endangers his own life and comfort, but imperils others to a degree not justifiable.

I. Let every parent see to it that each child is vaccinated before one year of age, and sooner, if possible.

II. Let no teacher or child be admitted to a public school without vaccination.

III. Let provision be made by school trustees and Boards of Health for free vaccination to such as need this provision. (See *Chapter 153, Section 10, Laws of 1880.*)

IV. Would it not be well, just before each April vacation, to have schools close an hour earlier and thus have a *vaccination day*, on which all scholars were invited to be vaccinated by their physicians, at home or, by some public arrangement, at the school building?

V. Do not concern yourself about the kind of virus used any more than you would about the source of the medicine you take, but hold the physician responsible therefor. Have the sore examined and take a certificate from the vaccinator, that, in his judgment, you are successfully vaccinated.

VI. Have vaccination repeated or retried after the age of sixteen. Most persons, if fully vaccinated the first time, will have but little result from the repetition, but it is advisable to have this additional assurance of safety.

VII. If smallpox or varioloid occurs in your house, do not attempt concealment. At once send for your physician and do as he advises you, or notify the Board of Health. Have every member of the family vaccinated. A notice, "Smallpox," should be put up, unless by some other means the possibility of persons coming in unawares can be prevented.

MODES OF PROTECTION WHEN A CASE OCCURS.

Up to the time when pustules form, smallpox is no more contagious than measles, and needs the usual care of all infective diseases.

There should be no unnecessary furniture, curtains, or loose articles in the room. The secretions from the nose, mouth and throat should go upon some ashes, chloride of lime, or into a disinfectant solution. (See in full, Circular as in report of 1879 and 1880.) Good ventilation must be secured. Arrange as to bed and under-clothing with the view of having it burned after the recovery of the patient.

For fear of carrying the disease to others, no person, save the two nurses, who alternate in service, should be admitted to the room, and these should not mingle with others during their attendance. It is generally possible to use an upper room, or to separate, so as not to require removal. But this will depend upon the extent of the epidemic, the locality and so many other points that it must be left to be decided by the physician or Local Board of Health. All discharges should be promptly disinfected and then not thrown into the common sink or water-closet. One-half pound of sulphate of iron (copperas or green vitrol), or one ounce of sulphate of zinc (white vitrol), or one ounce of sulphate of copper (blue vitrol), or one ounce of chloride of zinc (butter of zinc), or one ounce of chloride of lime (bleaching powder), put to a quart of water will answer, if used so as to cover or mingle with the secretions to be disinfected.

Women, in nursing, should have the hair covered by a cap, and men should have the hair cut short and whiskers either trimmed or removed, if, during their attendance, they will have any occasion to mingle with others. If so, there should be an entire change of clothing in an adjacent room and thorough washing. As, if persons meet you and smell any disinfectant, it will be called a smallpox smell, it is best to get an ounce of thymol and dissolve it in four ounces of alcohol, and use a tablespoonful of this in a gill of water as a wash. Or half a drachm of nitrate of lead, dissolved in a pint of boiling water, to which, afterwards, a pailful of water and a tablespoonful of common salt are added, is a good wash, and, also, of value for washing clothing and vessels. Two drachms of chloride of zinc to a half gallon of water, is of similar service. The patient, after recovery, needs all this care, as to washing, to cleansing the hair, ears, mouth, etc. It is generally best to fumigate the rooms after they are vacated. (See Circular already referred to.)

All beds used by the patient had better be destroyed, unless they can be submitted to baking and fumigation under skilled direction. During the sickness, a tub, with a disinfecting solution in it, should be in the room, into which handkerchiefs, changed garments, etc., should be dropped immediately after use, and boiled soon after. Two ounces of chloride of lime, or one ounce of sulphate of zinc, may be added to each gallon of the water into which the garments are boiled.

In case of death, the body should be wrapped in a sheet saturated with a disinfecting fluid. The coffin should remain in the sick room until the time of burial. If only all precautions are used, while

there should be no unnecessary delay of burial, there is no need of hot haste. With what we know of vaccination and of means of caring for smallpox patients, and of modes of disinfection, a smallpox scare is a very indefensible thing.

In many cases a *hospital* is needed. Let this be well prepared, even if hastily, with a rear wing for kitchen, with a separate laundry room and with an extension in one or both sides for water closet. Patients must not be hurried there at risk of life, and when they get there should find the best provision for their recovery. Cases of varioloid must not be too quickly dismissed, as they often convey the disease. When smallpox occurs in your district, do the right thing promptly and do not waste the first week in consultations. Every Local Board should have its executive officer, who should know how to stop the spread of the fire before it has attained headway. We urge upon all Local Boards the prevention of smallpox, scarlet fever, diphtheria and other preventible diseases.

To pursue a disease, in order to stop it, is often a duty; to get ahead of it, both a privilege and a duty, and very often possible. To prevent is to anticipate, to go before; and Health Boards, as well as individuals, may thus be of great service. Afterthought is sometimes good—forethought is better.

CIRCULAR TO LOCAL BOARDS OF HEALTH.

TRENTON, April 1st, 1881.

It is spring time, and all Local Health Boards should make a careful inquiry as to the duties that devolve upon them, and how they may be best performed. These are clearly defined in an act entitled "An act concerning the protection of the public health and the record of vital facts and statistics relating thereto," approved March 11th, 1880. (See *Laws of 1880, and Fourth Annual Report of the State Board of Health*). Another act is just now passed, which is as follows:

AN ACT relating to local Boards of Health.

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That all township or local Boards of Health in this State, organized under the provisions of an act passed March eleventh, one thousand eight hundred and eighty, entitled "An act concerning the protection of the public health, and the record of vital facts and statistics relating thereto," may expend for the purposes for which said Boards are authorized, to the amount of fifty dollars as actual expenditure, not includ-

ing any payment to members for attendance at the meetings of said Boards, and the same shall be payable in the same manner as other bills presented to the collector, treasurer or other disbursing officer of the township, town or precinct; and in case any additional sum is, in the judgment of such Board, needed to be expended in any township, town or precinct, the need thereof shall be presented to the township committee, common council or other governing board, and they shall have authority to appropriate such an amount, or pay such bills, as they may deem necessary for tho purposes indicated in the act aforesaid.

2. *And be it enacted*, That any Boards of Health now organized in any of the cities of this State, under the provisions of their respective charters, as well as those which are only health committees, may, by the order and direction of the mayor and common council of said cities, organize their Boards in accord with the provisions of the act aforesaid, and shall, in common with the Boards of Health of the several townships, towns or boroughs of this State, have power to make and enforce such ordinances as the care of the public health demands.

Approved March 22d, 1881.

Under these two laws, every city and every township of the State must have its Board of Health. Two or three of our largest cities have Boards formed under "the provisions of their respective charters," but, in most of our cities, so-called Health Boards are only Health Committees, or formed by ordinance instead of according to chartered directions. All such should now organize under these two laws, as some have already done under the law of 1880.

The few townships that failed to organize Boards must now do it promptly, as the law is compulsory.

In our recent experience with smallpox, new evidence has been furnished how necessary it is to have such Boards in all localities, so that when any case of contagious disease, or any nuisance hazardous to health occurs, there may be no delay. The citizens of each precinct have the right to be able at once to find some authority charged with the duties specified in the law.

All township Boards should hold a meeting at the spring meeting of the township committee, so as to consider any nuisances or evils detrimental to the general health.

While the law only allows $50, as payable by the township, it also provides that the township committee or council may authorize further expenditures, and in case of special meetings, or service on the part of the Board, may compensate therefor, if township committees so direct.

Most Boards need to empower an executive officer to act for them in case of any sudden emergency. There must be an accurate report each year to the State Board, as required under the law. Where

there is no medical member of the Board, or no township physician, the Board may invite some physician to meet and advise with it.

Health Boards have an important duty in co-operating with the city clerks or assessors in securing complete returns of marriages, births and deaths.

With these properly returned, we are able to make out from year to year, or through longer periods, the health and growth condition of any locality. Thus, any hearsay as to healthfulness or sickness can be corrected, and, if any disease is found to prevail above a general average, we thus detect causes and correct them. The progress of population and the causes affecting the growth of sections can be studied, not merely for curiosity, but in the interests of political economy and social advancement. It is thus that whole communities have their health interests studied systematically; thus, we ward off and modify disease and secure increase of growth. As health is capital and wages, we thus look after a great condition of success. There is no more important census of population. It can only be secured at the time the events it records are occurring. If left to the end of the year, or for semi-decennial record, experience shows that the results are too imperfect for study. The law is now well complied with by ministers, physicians, etc., except that carelessness or postponement as to birth returns annoys town clerks and assessors and delays tabulation.

It is important that records of meeting and a copy of reports be kept in the township health book. It is also advised that the names and dates of each birth and marriage be kept, and of each death, with the name of the disease. This aids in future study. The State index and transcription, which is kept in full, furnishes data for comparison, and will help localities to know their conditions and what evils they need to guard.

The four reports of the Board clearly indicate the work to be done. Some of these cannot now be furnished, but the last report will aid much in this direction. *Local Boards must see to it that all circulars, reports, etc., sent, are not carelessly retained by assessors or others, but passed over to each successive Board.*

In addition to the duties indicated, local Boards should notify us of any contagious diseases among animals, with the names and post office address of the owners. We are now specially anxious to rid the State of pleuro-pneumonia, which prevailed in some localities last summer.

The titles of several bills just passed, and applicable to special cases,

will be found in the fourth report. The one as to drainage is very important. There is now enough law for most cases. What is most desirable is a comprehension of what is needed and proper to be done, and the doing of it by right methods. Those who have power to enforce a law, because of that power, have far greater chances for persuasion in securing right action without legal process. But this must not mean delay or tampering with dangers to the health. We ask all Boards to become informed as to their duties, and then to perform them with that prudeuce, energy and determination which the circumstances of each case may require.

Any letters of inquiry may be addressed to the Secretary of the State Board or Bureau of Vital Statistics, Trenton.

E. M. HUNT,
Secretary and Medical Sup't of State Vital Statistics.

CIRCULAR OF SUGGESTIONS TO BOARDS OF HEALTH AND REFERENCES TO SANITARY LAWS.

TRENTON, N. J., May 10th, 1881.

The State Board of Health has been requested to outline the plan of organization of Local Health Boards, to indicate their general method of work, and the most feasible plan of dealing with nuisances prejudicial to the public health. In any advice that can be given, it must be remembered that very much depends upon circumstances of locality, of density of population, and upon special exposures or threatening of disease. Yet some general indications may be noticed.

I. A Board should have accurate organization, so as meet at a stated time, having its chairman and secretary, and keep a record of its proceedings. Its rules of order are the same as other Boards met for the transaction of public business.

II. It is not merely a Board to hear complaints, but to get an accurate idea of evils which cause, or are known to prepare the way for, sickness and death. In one place it may be undrained land, so saturated with water and vegetable matter as by changes in temperature and moisture to give rise to fevers; in another locality it may be poor water supply or defective sewers, or the want of a sewer system; in another, the careless disposal of garbage; in another, too near proximity of wells and outhouses; in another, cesspools which soak the ground with filth. But in any case, such a Board should be one

of inquiry, to collect accurate facts and deal with real evidence. In most Boards will be found some one who knows how to collect and study facts, or keep them on hand for study until enough are gathered.

III. Such a Board needs to keep in view, from year to year, where sickness and death have occurred, and the causes thereof, to know the number of children born and living in their district, so as to know the age of the material subject to disease, and various other facts, which, when observed with care, over a sufficient period, lead to conclusions as definite as those derived from a study of any other of the courses of nature.

Such a Board has great value as an educator of the public in the avoidance of the causes of ill health. It is in a position to advise and to acquaint the public with the various laws as to the prevention and abatement of evils prejudicial to health. Many bad household and town arrangements are those of ignorance, and are easily corrected when a better way is shown. The Board can also, by its circulars, ordinances and instructions, deter many from infringements which would otherwise occur, and thus act as a preventive of disease. Most Boards should have an executive officer, who should be informed as to the most dangerous nuisances and the best means of riddance. Cities need to have a special sanitary inspector, upon whose good judgment and knowledge they can rely for the correction of many evils, as well as for enforcement of the law, when necessary.

IV. In cities under sanitary police, it is not best to adopt many ordinances, but rather to indicate what should be, and then to deal with any case in which a nuisance is certified. It is not necessary, under the general laws of the State, to prove disobedience of an ordinance, but only that the thing complained of is contrary to the law. Ordinances are valuable only as warnings or as defining more closely the scope of the law. It has been a mistake of many cities to promulgate too many ordinances and to enforce too few. A waste of dead letter makes administration less perfect. Neither do health laws or health codes supersede common law. They provide speedy modes of riddance, leaving any question of trespass to be decided afterwards. Nor, is it necessary that all reliefs in the interest of health and life should come through the legal action of Local Health Boards.

It is important that their legal powers should be exercised in all that class of cases in which the usual process of courts would be too tardy, and that, by their inquiries and investigations and recommendations, they should aid forward all efforts made under common law,

or under statutory provisions for appreciating the public health, so far as its protection falls under such jurisdiction.

The duty of discussing and exposing evils, of suggesting relief, of making recommendations, and of giving information, is a great one. A suit, when a necessity, like the amputation of a limb, is not the greatest evidence of skill or usefulness. Boards of cities and townships do very much to prevent and abate evils, by the very facts which are brought out in their discussions, and by turning public attention to existing evils.

The president of a Local Board in a village government, recently told us that in his city the tendency to attack and remove nuisances was such that the Board had come to be regarded as a regulator and mediator, rather than a Board of compulsion, and had done great good by information and judicious advice, although not hesitating to act both in preventing and abating nuisances where law was needed.

V. Any Boards wishing to study the scope of local ordinances, may find these in the Sanitary Code of the Board of Health of New York City, or of Hudson county, or of the Jersey City or Newark Health Department. A copy of some one of these will be sent on application to us.

The attention of all Boards of Health is directed to the following laws:

Chapter 155, Laws of 1880. "An Act concerning the protection of the public health, and the record of vital facts and statistics relating thereto."

Chapter 135, Laws of 1881. "An Act relating to Local Boards of Health."

"An Act to prevent the introduction of malignant and other infectious diseases in the State." (*Revised Statutes of 1877, p. 300.*)

Chapter 239, Laws of 1878. "An Act concerning the registry and returns of Marriages, Births and Deaths."

Chapter 81, Laws of 1879. Supplement to the above.

See, also, *Third Annual Report of State Board of Health, for these Acts united.*

Chapter 158, Laws of 1881. "An Act to provide for drainage where the same is necessary to public health."

Chapter 159, Laws of 1881. "An Act to authorize the abatement of nuisances in cities, and to make the cost and expense of such abatement a lien upon lands whereon such nuisances existed."

Chapter 210, Laws of 1881. "An Act for the improvement of the sanitary condition of counties in this State."

Chapter 220, Laws of 1881. "An Act authorizing the construction of sewers and drains, when necessary to preserve the public health."

Chapter 217. "An Act concerning the adulteration of foods and drugs." Approved March 25, 1881.

Chapter 192. "An Act to prevent the manufacture and sale of adulterated lard." Approved March —, 1881.

Chapter 141. "An Act to prevent the adulteration of milk, and to regulate the sale of milk." Approved March 22, 1881.

Chapter 154. "A Supplement to an act entitled 'An Act to establish a State Board of Health.' Approved March 9, 1877." This is an act relating to the contagious diseases of animals, and was approved March 23, 1881.

Vaccination. (See *Laws of 1880, Chapter 155, Section 10.*)

Various other acts of less importance, or local acts for cities, may be found by reference to the Revised Statutes and laws since passed. (See, also, list of *Health Acts, First Report, p. 143;* and *Laws and Circulars in Third and Fourth Reports,* which can be sent on application).

We add a number of suggestive questions indicating what Boards of Health should know or inquire about. Some of these apply only to cities and some only to townships, but are worthy of thought according to the needs of each locality.

What is the area of the city or township?

What the density of population?

What the character of geological structure and soil?

What the natural drainage?

What the needs of additional drainage arising from structural alterations?

Are there ponds or stagnant pools, or any other interferences with proper drainage?

Is there a sanitary map, so that the location of all underground pipes or the plan of all underground work and the contour of surface can be easily known?

Are plans devised or executed for proper drainage?

In cities, is foresight had as to public parks?

Are there any free baths?

Are there careful arrangements to prevent nuisances, as well as for their abatement?

Are cases of contagious disease reported to you either by the head of the family or by the physician?

Have you plans and provision for dealing with any case of contagion, such as small-pox, typhus fever, etc.

Is there any sanitary inspection of public buildings?

What trades or occupations are injuring the health of operatives?

Have factories any system of ventilation?

Are there factories of which the odor or refuse is a nuisance?

Are there slaughter-houses which are a nuisance?

Is there any inspection of city stables or cow-pens or hog-pens?

Is there any inquiry into the adulteration of milk, of foods, or of drugs?

Is kerosene ever tested, or are there accidents therefrom?

Is a record kept of diseases, or of deaths and their causes and locality, that you may compare different parts of the same city or township?

Do you aid the assessor or city clerk in securing the returns of marriages, births and deaths, so that the vital and essential conditions of local prosperity may be known?

Is vaccination systematically secured?

Does the assessor or city inspector regularly report to you any condition which he regards as hazardous to the public health?

HOUSES.

What is the condition of cellars and basements?

How are walls as to dryness or dampness?

What fire-escapes or provisions for fire?

What the condition of tenement houses?

What is the water supply of each house?

Is there a well or cistern supply? How many use wells instead of the public supply?

Are there any cesspools which have been once used and then filled up?

How near are cesspool, well and out-house?

Does the Board of Health know the sanitary condition of each house in those matters which most concern the health of the community?

If there are sewers, is their condition thoroughly known?

Are house connections watched and carefully superintended when new buildings are erected, or when changes are made?

How is storm water disposed of?

Give size, location and construction of present cesspool, and how emptied.

How are ashes, garbage, etc., disposed of?

Are there houses or outdoor water-closets? If so, how are they cared for or emptied?

For other questions and suggestions, see *Fourth Report of the State Board of Health*.

E. M. HUNT, M. D.,
Secretary and Medical Superintendent of Vital Statistics.

CIRCULAR OF THE NEW JERSEY STATE BOARD OF HEALTH AS TO SANITARY, HOUSEHOLD AND ORNAMENTAL ARTICLES AND APPLIANCES.

TRENTON, N. J., July 1st, 1881.

In the practical applications of sanitary science, it has become necessary to use very many appliances, both for convenience and to guard against evils incident to household and city life. These inventions have become far more numerous and useful than

is generally known. To afford the people a better opportunity to become acquainted with their merits, both by personal examination and by the opinion of experts, the State Fair of New Jersey and the State Board of Health, in 1879, united in an exhibition of sanitary appliances. Although it was the first of the kind attempted in this country, it was so highly successful as to lead us to make it a permanent and prominent feature at this great annual gathering of our citizens. This fair is held for a week each year, only a few miles from New York City, near Newark, and on the direct route to Philadelphia and to the South and West. The attendance from this and other States is very large, and it affords the best opportunity for familiarizing the people with valuable improvements. It opens this year September 19th.

A special building, supplied with water, is provided, and the actual working of house-systems, ventilators, and various other appliances can be shown.

It is intended to make this exhibit an attraction at our Annual Fairs, so that all may become acquainted with the best sanitary arrangements, and inventors and dealers have a good opportunity for comparing and testing apparatus. When necessary, the judges will order trial, and postpone award until satisfied.

Specimens, models or drawings may be sent either as competing for premiums or for exhibit. Every article should bear a descriptive label, containing detailed information respecting its construction, use, retail price, and the place at which it can be obtained. There is no charge for space. Facilities will be afforded for those who desire to show any apparatus in actual working. Articles must bear the name of the owner or agency exhibiting. The small cost of conveying goods to and from the fair must be borne by the exhibitors. Letters of inquiry may be addressed to E. A. Osborn, C. E., Middletown, N. J., or to State Board of Health, Trenton, N. J. Articles sent for exhibit in our care should be directed "New Jersey State Fair, Waverly. Care of New Jersey State Board of Health."

MUSEUM.

The State Board of Health has commenced at Trenton, the capital of the State, a museum of sanitary appliances, to which any owner or manufacturer may present the articles exhibited as the property of the State, for permanent examination and exhibit. Or they will, by us, be directed to the persons or agents with whom they are to be left. Specimens of all new sanitary inventions are solicited.

The following is an abbreviated summary of leading articles, but various other articles will properly come in this department, and be subject to award.

DEPARTMENT K.

SANITARY, HOUSEHOLD AND ORNAMENTAL.

CLASS 71.—CONSTRUCTION, MATERIALS, ETC.

	PRIZE.
Samples of Building Stone, Concrete or other Building Material	Diploma.
School-room Furniture and appliances	Diploma.
Pipes, Tile, etc	Medal.
Wall Paper and House Decorative Materials	Diploma.
Sanitary Pottery, etc	Diploma.
Sanitary Models for care of animals	Diploma.

CLASS 72.—HEATING AND VENTILATING APPARATUS.

	PRIZE.
For Warming Houses by Flues, Steam or Hot Water. Best system of each	Silver Medal.
Steam or Gas Cooking Apparatus	Medal.
Stoves for Heating or Cooking so as to avoid gas and dust	Diploma.
Chimney Cowls and Caps	Diploma.
Specimen Ventilators of all kinds	Medal.

CLASS 73.—DRAINAGE AND WATER SUPPLY.

Drainage Plans or Sanitary Maps	Grand Medal.
Specimens of Soil and Organic Matter from "The New Jersey Experimental Station,"	Medal.
Water Supply Apparatus, as Cisterns, Flush Tanks, Filters, Coolers, Sinks, etc., best form of each	Diploma.

CLASS 74.—BATHING APPARATUS AND BATH ROOM FIXTURES.

Bath Tubs and Connections	Diploma.
Best Water Traps and Grease Traps	Each a Medal.
Dry Earth Closets	Medal.
Best Pan, Hopper and Plunger Water Closet	Each a Medal.
General assortment of Plumbers' Work and Material	Medal.
Gas and other Lighting Material and Fixtures	Diploma.
Electric Light Fixtures	Medal.

CLASS 75.

Druggists' Samples, Disinfectants..
Preserved Foods, Health and Condensed Foods, Invalid Preparations.
Refrigerators, Food Preservers..
Yeast Powders..
For selection of each class........................Silver Medal, Medal or Diploma.

CLASS 76.

Excavating and Odorless Apparatus, Outbuilding Models and Miscellaneous Sanitary Goods........................Medal or Diploma.
Other Exhibits of Sanitary Appliances may have Medal or Diploma as award.

CLASS 77.

Life and Labor Saving Apparatus	
Life Boats and Preservers or Life Rescue Apparatus	Medal.
Health Lifts—Gymnasium Apparatus	Diploma.
Sick-Chairs, Beds, and other Sick-room Conveniences	Diploma.
Invention and Appliances for Relieving Constrained Positions or for Diminishing Health-risk in Various Industries	Medal.

CLASS 78.

Food Adulteration and Testing Apparatus..

Exhibitors are entitled to admission tickets.

The general direction of the Department is assigned to E. A. Osborn, C. E., Middletown, N. J., and E. Dunn, 104 Market street, Newark, N. J.

The following persons are in charge of classes and assisted by others in sub-classes:

Class 71. Samuel C. Brown, Trenton, N. J.

Class 72.

Class 73. Prof. George H. Cook, New Brunswick, N. J.

Class 74. Mr. Taylor, Newark, N. J.

Class 75. Charles A. Amende, Hoboken, N. J.

Class 76. William K. Newton, M. D., Paterson, N. J.

Class 77. H. A. Hopper, M. D., Hackensack, N. J.

Class 78. William H. Newell, M. D., Jersey City, N. J.

These gentlemen will be aided by a committee of direction, consisting of Amos Clark, Jr., President, and William M. Force, Recording Secretary of New Jersey Agricultural Society, No. 764 Broad street, Newark, N. J.; Hon. Phineas Jones, Newark, N. J.; A. D. Newell, M. D., New Brunswick, N. J.; R. Wescott, M. D., Elizabeth, N. J.

CIRCULAR TO LOCAL BOARDS OF HEALTH.

TRENTON, October 1, 1881.

All Local Boards of Health need to make their annual return to the State Board of Health during the month of October.

All Boards which were constituted under the law of last year are permanently in existence. The law of itself constitutes the township committee, the assessor and the township physician, if there be such an officer, as the Board of Health for each township; and also provides as to Boards of Health in cities.

In some cases complaint is made that Local Boards do not seem to know their precise duties under the law. The general law is to be found: chapter 155 of the laws of 1880.

On pages 272–282 of the fourth report of the Board (1880) is an explanatory circular as to the law and the duties of Health Boards. That report was sent to each assessor, as a member of the Board of Health, and for its reference and use. If in any instance any Board has failed this year to consider the health matters of its town or township, it should at once be called together. It is satisfactory to know that most of the Boards realize the importance of this oversight of the public health. Some, however, take it for granted that no avoidable causes of disease exist, and by their unintentional negligence add to the sickness and to the deaths of their locality.

We ask each assessor or town clerk to state to us any failure on the part of the Local Boards.

The same blanks are furnished as those of last year.

A list of the Boards which reported last year (187 in all) is to be found on pages 119–179 of the Fourth Report (1880).

Boards which reported last year will not need to report the items in the schedule under A, B, E, F, G, I, L, M, N, O, P, Q this year, unless some special new fact exists.

Under C, we ask full statements as to the sources and conditions of water supply; as to objections made to it; as to any assured or proven sickness or deterioration of the general health resulting therefrom; also, what plans of remedy are used? also, if cisterns or driven wells are used and found satisfactory? also, if filters, and if so, what kind are relied upon? Has the lowness of the streams and wells the last three months seemed to affect the quality of the water supply?

Under D, we inquire as to any natural or artificial defects in drainage, and as to any sickness attributed thereto by physicians. How has the amount of malarial fever, so called, compared with that of last year? Are there any serious interferences with natural water-courses? Has the State law as to drainage, or the special one in addition as to drainage of cities, been applied to any case in your section?

Under D, as to sewerage, specify what town or parts of towns have sewers, with their size, construction, material, etc. Has the town a sanitary map, showing its underground structures, its contour, etc.? To what extent are brooks or streams made to carry sewage matter, and have any evil results been felt?

Under H, report the situation of water-closets in relation to water supply and the modes of disposal of excreta, of refuse and of slop-water. Also, cases in which inside water-closets, or slop, or kitchen sinks are connected with the outside privy vault or with cesspools. Also, as to the common mode of emptying privy vaults and cesspools.

Under J, give particulars as to diseases of animals; especially those regarded as contagious.

Under K, state whether slaughter-houses and abattoirs are situated near to private houses.

Under R, report any sanitary improvements of the past year, and any in contemplation.

Under W, add a general report as to prevalent diseases from July 1, 1880, to July 1, 1881, and make a separate noting as to any especial sickness from July 1, 1881, to this date.

Assessors and town clerks in addition should personally report, as is their duty, any neglect in returns of vital statistics, and by whom; since the records of the last three years already show how important exact knowledge as to the marriages, births, deaths and causes of death in each division of the State. Many other matters of importance will no doubt occur to Local Boards, on which report should be made.

We should be glad to have brought to our notice any alleged defects in existing laws. Except that defects of close study of the laws and of judicious enforcement or administration of law are not to be attributed to the laws themselves.

Indifferent attention to duty, dilatory dealing with undoubted nuisances or promiscuous doubts where legal advice would clearly point out the methods, are not to be taken as defects of law. It is found that the calm judgment of courts and juries is against nuisances prejudicial to the public health; that present laws are applicable to such nuisances, and that where reason and persuasion will not avail, the execution of sanitary law has as good chance of being sustained as has any other form of necessary litigation.

Let town clerks and assessors see to it that all circulars sent them are read before the Board of Health or township committee, and copies fastened in the Health Book.

By order of the Board.

E. M. HUNT, *Sec'y.*

(CIRCULAR D.)

TO FARMERS AND DEALERS IN STOCK.

APRIL 1st, 1881.

The experience of the State Board of Health for the past year has shown how important it is to guard against the contagious diseases of animals. Besides the very large pecuniary loss, their effect upon the quality of meat and milk supply tells upon the public health.

PLEURO-PNEUMONIA.

Our chief attention for the year has been directed to pleuro-pneumonia. It has prevailed in but few neighborhoods, but in these the losses have been such that the people fully realize the necessity of preventive measures.

It was in every instance brought in by purchased stock, or spread by neglect of early separation. It does not spring up from any bad local conditions, although filth and bad care favor its spread. When new stock is purchased, unless its source is fully known, it should be kept for two months from the general herd. Any case of sickness should be promptly removed four or five hundred feet from other cattle, to some shed not to be used for other stock.

So soon as there is reason to suspect pleuro-pneumonia, the fact should be promptly reported to the State Board of Health. Our former circulars (A, B and C) give full particulars as to methods of notice, disinfection, &c. These are to be found in the fourth Report of the Board, in hands of Local Boards of Health, or to be had on application. The disease, while not transmissible at long distances, is distinctly communicable, and its limitation depends on the exact carrying out of plans of separation and disinfection. The person who attends to the sick animals should not go near the other cattle, or not until after careful washing and airing.

In addition to directions in former circulars, the English law directs, first, the removal of all litter and other matter, and thorough cleansing of stalls; second, "the application to the floor, and to all parts above the floor, with which animals or their droppings have come in contact, of a coating of lime, made by mixing good freshly-burnt lime with water, and containing in each gallon of lime wash either one-fifth of a pint of commercial carbolic acid, or one-fifth of a pint

of cresylic acid, or four ounces of fresh dry chloride of lime; such lime wash to be prepared immediately before use."

All localities which had the disease last year should at once use every precaution. The law has been made fully effective by the amendments of the last Legislature. Unless the disease is brought to us from outside the State, it is now within the range of extinction in this State. Negotiations are now being had which it is hoped will modify the restrictions on cattle traffic imposed by the New York authorities in 1879.

PLEURO-ENTERETIS OR SWINE FEVER.

This disease, wrongly termed "cholera," needs the same precautions as to purchase of stock, and the same promptness as to separation of sick animals. So soon as the disease is identified, prompt slaughter, the change of the hogs from their pens, and thorough cleansing, are required. In one section of the State there were large losses last year. It spreads chiefly, if not entirely, by contagion, and can be greatly limited. Separate, slaughter, disinfect.

GLANDERS AND FARCY.

These are different forms of the same disease, transmitted chiefly, if not entirely, by a discharge from the nostrils getting upon a thin membrane or a raw surface. Mules seem even more susceptible than horses. It can be communicated to men, and, when so, is fatal. It is on the increase in this country, and in this State. Because the animal is not always at once laid aside from work, it is the more apt to spread. Several cases have been reported the last year. Owners should have some skilled veterinarian decide as to the disease, and know they are liable to damages if other horses contract the disease. Treatment never succeeds; the animal must be killed. (See *Revised Statutes, p. 24.*)

HYDROPHOBIA.

This disease has been unusually prevalent the past winter. Several letters in respect to it have come to us from different localities in the State. There is reason to fear that many cases may occur during the summer. Where any case has occurred Local Boards of Health should warn owners against having dogs run at large without muzzles, or unless in charge of some one. Local township Boards have now the

same powers to pass health ordinances as have city Boards, so far as these are applicable and are justified by the need thereof. It is always a matter of discretion with Boards as to what precautions are necessary for the public safety. Persuasion and prudence are most valuable. But this does not mean hesitancy in action in accord with law where there is such hazard to public health as comes within the range and duty of State or local enactment. (See *Revised Statutes, p. 25.*)

Some of the minor diseases of animals are also communicable, and need to be guarded against. The disease, for instance, often called chicken cholera, which is a specific blood infection, affecting various glands, is chiefly to be limited by separation, although recent discovery claims for it a system of vaccination. It is well for all who deal with animals to know that many of their diseases are now well understood, as well as their treatment, or, if not, the uselessness of treatment, and the need of immediate slaughter. Many diseases are thus limited or prevented, so that the loss is restricted. Promiscuous dosing of animals is too often mistaken kindness and real cruelty. As to all communicable diseases, farmers and dealers should themselves know the risks. By avoiding purchases from infected districts; by quick separation of first cases; by proper disinfection and by skilled advisement, none of these diseases can become extensively epidemic in this State. This Board has occasion to acknowledge the valuable co-operation of the State Board of Agriculture and of farmers in various districts.

All communications should be addressed,

STATE BOARD OF HEALTH,
State House, Trenton.

CONTAGIOUS DISEASES OF ANIMALS.

Acts of 1880 and 1881, combined so as to show the law as it is at present:

AND BE IT ENACTED, *By the Senate and General Assembly of the State of New Jersey,* That in addition to the powers conferred by the act to which this is a supplement,* said Board shall have full power and authority to examine and determine whether pleuro-pneumonia, rinderpest, or any other contagious or infectious disease exist among any animals in any county in this State; and that the sum of five hundred dollars is hereby appropriated to defray the actual necessary expenses of said Board while making such examinations.

* The powers here referred to are those given in the act constituting a Board of Health, viz.: "to make inquiries and reports in reference to diseases affecting animals, and the methods of prevention." March 9th, 1877.

And be it enacted, That in event of any contagious or infectious disease, as aforesaid, breaking out or being suspected to exist in any locality in this State, it shall be the duty of all persons owning or having any interests in said animals, or any person called as a veterinarian to see such animals, to notify the said Board of Health, or any one of them, of the existence of such a disease, and thereupon it shall be the duty of said Board of Health, or some one designated by them, to investigate the same, and quarantine said animal or animals, and take such precautionary measures as to any animal sick, or as to other animals that have been or are in proximity thereto, as shall be deemed necessary, and to enforce such regulations as may be adopted by such Board of Health; or if said Board, without notification, has any reason to believe that any such infectious or contagious disease exists in or among any animals in this State, it shall have the same power of inquiry and examination, and the same rights of jurisdiction as are herein provided, where there has been notification by the owner or those having possession thereof.

And be it enacted, That any person or persons refusing or neglecting to notify said Board of Health, or any of them, of the existence of pleuro-pneumonia, rinderpest, or any other contagious or infectious disease among cattle, shall be deemed and adjudged guilty of a misdemeanor, and upon conviction shall be punished by a fine of not more than two hundred dollars, or by imprisonment not exceeding one year, or both, at the discretion of the court.

And be it enacted, That in all cases where animals affected with, or which shall have been exposed to a contagious or infectious disease, are ordered to be killed, or shall have been killed by order of the Board of Health, or its assistants, it shall be the duty of three members, who are freeholders, of such a Board of Health, of the city, township, or county in which the disease exists, as the State Board of Health may request, to appraise the value of the animal or animals so killed or ordered to be killed, taking into consideration the marketable value just previous to the time of attack of such disease; and the animal or animals so killed shall be buried by the owner thereof in the manner specified in the act to which this is a supplement; *provided*, that in no case shall said valuation exceed the sum of forty dollars for any one animal, or, in the case of registered cattle, shall not exceed one hundred dollars, one-half of said valuation to be paid by the State to the owner or owners, on presentation of such appraisement, signed by the appraisers, as provided for in the act to which this is a supplement

And be it enacted, That when any herd or portion thereof has been or is so exposed to any contagious or infectious disease, and the State Board of Health deems the disease likely to spread to that portion of the herd still unaffected, although isolated or quarantined, said herd may, with the consent of the owner or owners, and with restrictions agreed upon between them and the executive officer of the State Board of Health, cause or allow said herd or herds to be inoculated for the prevention of such diseases as can be thus mitigated; but any loss resulting from such inoculations shall not constitute any claim against the State, or the Board of Health acting as its agent; *provided*, that inoculation for pleuro-pneumonia shall in no case be allowed without the consent and approval of the State Board of Health, and by its direction, under the penalties provided in section eight of the act to which this is a supplement.

And be it enacted, That when any city, township or district shall be threatened with any contagious or infectious disease among animals, to such an extent as to seem to require more general precautions, the State Board of Health shall notify the local Board of Health, and with the advice and consent of the majority of said local Board of Health, may, for a time, prohibit the bringing of any cattle into such township

without inspection or a written permit, or may make distinction between fat and store cattle, or may prohibit the running at large of animals in the township, if not already prohibited by law, for such time as the township Board of Health shall advise.

And be it enacted, That the State Board of Health, in itself, or by its authorized agents, is hereby empowered to inspect any animal or animals in this State suspected of any contagious or infectious disease, whether belonging to citizens of this State or some other State or country, or when passing over ferries, or by other means of conveyance to or from this State, or to detain or send back the same, or to dispose of by slaughter, as provided in the foregoing sections of this act and the act to which this is a supplement; and in case there is evidence of any contagious or infectious disease of animals being conveyed from other States to this State, the State Board of Health may order and direct as to the places, days or time when animals may have egress or ingress from and to this State, and regulate the same, and with only such interference with traffic as the necessities of the case may demand.

And be it enacted, That all bills for money expended under this act shall be audited by the Comptroller of this State, and then submitted to the Governor for his approval, and after being thus audited and approved by the Governor, shall be paid by the State Treasurer, upon warrant of the Comptroller.

And be it enacted, That said Board shall keep a full record of their proceedings, and shall publish the same in the annual report of the State Board of Agriculture, yearly, and every year during the existence of this law.

And be it enacted, That if any person or persons shall, knowingly, either buy or sell, or cause to be bought or sold, any animal or animals affected with the pleuro-pneumonia, rinderpest, or any other contagious or infectious disease, all such person or persons shall be deemed and adjudged guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine not exceeding two hundred dollars, or imprisonment not exceeding one year, or both, at the discretion of the court.

And be it enacted, That in case an emergency shall arise, and a larger sum shall be deemed necessary than the amount appropriated by the preceding section of this act, said State Board of Health shall present the facts in evidence to the President of the State Agricultural Society, and the President and Executive Committee of the State Board of Agriculture, who shall authorize such additional expenditure as, in their judgment, they may deem the exigency of the occasion to demand; *provided*, that in no case shall the amount of money thus authorized to be expended, exceed the sum of five thousand dollars in any one year.

(CIRCULAR E.)

TO FARMERS AND DEALERS IN STOCK.

The last census of live stock in this State shows about one million of animals, and thus exhibits how large an interest we have in all that relates to their welfare. This is magnified by the fact that this State contains so much of the very best stock in the United States. The diseases of animals are as definite in their character, as avoidable and

as amenable to treatment as those of human beings. Where they cannot be cured, or where, as in epidemics, they tend to spread, their ravages can be very much diminished by separation, by disinfection, and by other methods well known to skilled veterinarians. Because this State is a highway for the conveyance of cattle to markets, and because much stock from other States is brought into this State, we will suffer much from diseases thus contracted unless proper precautions are used. We can point to large losses which in the last two years have occurred to individual owners from purchased stock.

The diseases which are most likely to occur from contagion or from communication from other animals, are:

AMONG HORSES.

I. Glanders or Farcy.
II. Strangles or Throat Distemper.

AMONG CATTLE.

I. Contagious Pleuro-Pneumonia.
II. Malignant Anthrax or Splenic Fever. (Common also to other domestic animals.)
III. Texas Fever (perhaps a form of Anthrax).

AMONG SHEEP.

I. Sheep Pox (variola ovina.)
II. Contagious Foot-Rot, Hoof-Rot or Foot-Halt.
III. Scabbies (scab or itch).

AMONG SWINE.

I. Pneumo-Enteritis or Hog Cholera.
II. Measles (from the larval form of Tape-worm).
III. Trichinosis (from the larval form of the worm. Trichinæ Spiralis).

AMONG POULTRY.

Fowl or Chicken Cholera.

As the design of State oversight of the contagious diseases of animals is chiefly to prevent them or to avoid their spread when occurring, those who desire treatment must chiefly look to books and to veterinarians.

The following are some *sanitary precautions* and directions applicable in almost all cases:

I. *To avoid contagion.*—Never introduce a newly-purchased animal of any kind into the general herd for a month or more, unless you know fully its previous keeping or ownership, or have a warranty that it has not been exposed to diseased animals. We could give many instances in this State where whole herds have been infected through a single purchase. Avoid especially city cow-pens, as these are great breeders of disease.

II. Let all animals be kept in a cleanly way and with regard to health. No domestic animal is benefited by filth, and most of their diseases arise therefrom, or are intensified and made to extend thereby. They thus become enzoötic or epizoötic, words which mean the same in relation to animals that endemic and epidemic do as to human beings.

III. If an animal is taken sick in a stall or pen or yard, let it remain vacant until you know what the disease is, and let it be cleansed before any other animal is put therein.

IV. Disinfectants, cleanliness, fresh air and whitewash are always valuable. Circular C, of this Board, names several artificial disinfectants. One of the most available is this: Dissolve sulphate of iron (copperas or green vitriol), two pounds to a gallon or sixty pounds to a barrel of water, stirring it from time to time so that it shall be fully dissolved; a pint of crude carbolic acid added to the solution increases its power. The solution can be freely sprinkled by means of a watering-pot, every two or three days, according to the character of the malady. Other disinfectants are also named in the circular of the Board of Health (third and fourth reports) to householders, city authorities and Boards of Health, and in the circulars which accompany this report.

V. If you have occasion to go into yards where there is some disease, do not touch or handle the cattle, if you have those of your own to attend to, or do not go directly to your own yard or stables. The danger is chiefly in actual contact or in going to other animals without free access to air.

VI. The person attending sick animals should not milk or attend to any other animals on the same farm, to which the disease might be imparted.

VII. Read carefully the laws of this State as to contagious diseases of animals, and the circulars of the Board of Health.

BRIEF NOTICES OF A FEW OF THE MORE COMMON COMMUNICABLE DISEASES.

GLANDERS OR FARCY.

These are essentially identical. The disease occurs not infrequently in this State, and is not only communicable to other animals, but also to man.

Several years since, a law of this State, which has not been repealed by the new act, made it a misdemeanor for any person to have or harbor a horse with this disease, and required the slaughter thereof. It is met with most frequently in its chronic form. The chief symptom is a glutinous and continuous discharge from the nostrils, owing to a deep or superficial ulceration in some portion of the nostrils. After a time, one or both glands beneath the jaw generally swell, and hence the name of glanders.

In an acute form there are similar lesions with severe fever. Mules are even more subject to it than horses. The making out of cases (diagnosis) must be left to veterinarians.

Preventive Measures.—At once separate the animal from others; clean and disinfect the stall; put no other horse in at present, and do not expose any other animals thereto. In most cases, immediate slaughter is the best management. The animal must be buried so that dogs may not get access thereto.

STRANGLES OR HORSE DISTEMPER.

Various forms of throat malady are known by this name. Catarrh of the membrances of the upper air passages and swelling of the glands about the jaw and tendency to pus formation are usual. Different epizoötics of it differ much, or it is sometimes mild and sometimes very malignant.

The infection is not far-reaching as a rule. It is least apt to attack old horses or those once having had it. Crowded and dirty stables make it much worse and more communicable, and then the forage and the building itself seem to convey the disease. It varies so in character that rules as to treatment vary. Disinfectants should be used and the discharges from the throat and nostrils or from pus cavities should, as far as possible, go into vessels containing some disinfectant, as, no doubt, these excretions aid in spreading the con-

tagion. It is well to separate the other horses from the one affected and not to have the same groom attend to all.

CATTLE.

Contagious Pleuro-Pneumonia.—Sufficient directions are already given in circulars (A, B, C, D,) and in the sanitary precautions of this circular.

Anthrax.—Anthrax and anthracoid diseases occur in the horse, in cattle, sheep and swine. The last year there were losses of all of these on one farm in Salem county. A form of the disease is sometimes called splenic fever, because the spleen is so uniformly found congested and enlarged. The Texas cattle fever is claimed to be a variety of this disease. The general symptoms of anthrax in its acute form are so rapid that often an animal is dead before the sickness is perceived. In other cases there is trembling and high fever, hurried breathing and a flow of blood or a very congested condition of the mucous membrances. It is most rapid in animals in good condition.

Sometimes it causes or is associated with local tumors and gets the name of anthracoid, erysipelas or carbuncle. Bodies change very rapidly after death. The post-mortem appearances of the mucous membranes of the mouth and other passages and the condition of the spleen, liver, etc., very much aid in determining the disease. As it is communicable and so fatal, great precaution must be used. Any discharges or any bodily material must not be allowed to come in contact with any other animal. Men may take it by having a scratch, or may absorb it through the skin from the diseased fluids. All the minutest rules of disinfection must be observed. The burial of the carcass should not be less than six feet, and long after an occasional load of lime and dirt should be thrown over the spot, as it is now claimed that long after, the earth-worms may bring up the septic material and convey it to other animals. The preventive use of attenuated virus by inoculation is now common in France. The precautions against Texas fever are the same as those above mentioned.

Strangylus (*Filaria*) *Bronchialis*, or other forms of strangylus, occur occasionally in cattle and produce congestion of the lungs and mechanical stoppage of the air-cells, and seem to extend to the entire herd. A few cases have occurred in this State. See Health Report,

p. 158, and report of Dr. Miller, 1881, in Report of Board of Agriculture.

SANITARY PRECAUTIONS AS TO THE COMMON DISEASES OF SHEEP.

Sheep Pox (*Variola Ovina*).—It is propagated solely by contagion, and probably never arises here spontaneously. Loss of appetite, often trembling, general soreness, high fever, and the eruption of little red nodules, which, in from twelve to twenty-four hours, are conical pustules, generally, easily mark the disease. The duration is about six days. It is very transmissible, as forage, pens and the wool and secretions convey it. Winds may convey it a considerable distance, according to concentration and virulence. Extensive sanitary police measures sometimes need to be instituted. Inoculation has often been resorted to with success. The sick should at once be separated from the rest. A second division of those doubtful is often advisable. All those that have it and recover should be quarantined for a time. The thorough washing of the sheep, after full recovery, is desirable. Butchers should not expose themselves to such flocks, or should use special cleansing afterward, so as not to carry the disease to other folds.

Contagious Foot-Rot, or Hoof-Rot, or Foot-Halt.—It is a disease which, as the name indicates, manifests itself in the foot or hoof. Some regard it as a local inflammation, or it may be caused by some fungus or other germ. The painful step, the red skin between the claws of the hoof, the pimples, pustules or vesicles, and the foul, viscid discharge, reveal the disease. The animal becomes feverish and sick, and its condition varies with the progress or relief of the disease. The appearance of the foot, the fact that only one claw or foot is affected, and the gradual spread of the malady among the flock, distinguish the disease from ordinary foot-soreness.

The preventive and sanitary measures are nearly the same as those already detailed. Separation of the diseased, and careful disinfection of premises must be used. The sheep-pens should be vacated and cleansed after recovery. The well sheep had better be removed for a time from the rest, and made to pass through a trough containing in the proportion of a pound of chloride of lime to a pail, or two and a half gallons, of water. Or the disinfectant solution already named of iron and carbolic acid will answer. The feet of those diseased should be often well cleansed in water, or powdered sulphate of copper (blue vitriol) applied, either in a very fine dust or in a solution of a half ounce to a pint, or mixed with tar, as may be directed.

Scabies or Scabs.—This disease is owing to a parasite insect (*acarus*) and is spread by its propagation and migration. The insect causes great itching, and so the fleece ere long becomes ragged. The shepherd soon perceives an uneasiness dependent upon skin irritation. The remedies are those which will kill the insect and do not hurt the sheep. Their name is legion and much depends on the mode of application. The preparation of Zundel, which consists, by weight, of quicklime, one part; impure carbolic acid, one and a half parts; carbonate of soda, three parts; and soft-soap, three parts, made into a stiff paste, is an example. For after-cleansing and disinfection of animals, buildings, manure, and forage, directions already given suffice.

The forms of scabies or itch caused by an insect and known as *Mange* in horses, cattle, pigs and poultry, is of much the same general character, although not so communicable as that in sheep.

COMMON CONTAGIONS OF SWINE.

Pneumo-Enteritis, or Hog Cholera.—Directions as to this have already been given in former circulars. Entire separation of the sick and well, and generally destruction of the sick ones, is required. Removal of the entire stock to new inclosures often helps very much to limit the disease. It still prevails in our State and may become a very serious malady.

Pig Measles.—This disease depends on an animal parasite in the form of a bladder-worm, the *cysticercus cellulosus,* belonging to the *Cestoda,* or tape-worm class, the tape-worm being the *Tænia solium.* It is in the pig in the larval form, and when ingested by man becomes developed into the tape-worm—a disease which we have some reason to fear is increasing in this country. Even where the cysts are not in a condition to do harm, the measly pork is a very inferior article of food.

Often, the first indications of the disease are that the animal does not thrive. The tongue, carefully examined on its under part, toward its root, will often show bladders from the size of an oat-seed to a pea, slightly transparent and standing out a little from the membrane. These are cysts, like those elsewhere in the body. A sore snout and a roughened voice, slight cough and languor, often characterize the disease. Other symptoms occur according to the amount of cysts, unless the sausage machine interrupts the progress. It is pleasant to know that the cysts will not hatch three or four days after the death

of the swine, but this does not add to the quality of the pork. The cyst does not hatch in the pig, but only when transferred to another medium, as man. Fleming rapidly sums up the mode of prevention: "As pigs cannot become affected unless they swallow portions of the human tape-worm containing the germs of the parasite, the preventive measures are sufficiently indicated. *At the same time*, the sanitary authorities should take precautions against pigs of a vagabond disposition ingesting dangerous filth, by forbidding the disposition of human ordure in any but proper places, to which pigs cannot have access." This is also a strong reason against city pigs.

Trichinosis.—This is another disease arising from a parasite or worm known as the *Trichinæ spiralis*. As this is not yet authenticated to have ever occurred in New Jersey pork, we merely allude to it here.

Chicken Cholera.—This disease causes great losses in some counties in this State. The following quotation from Pasteur (see Agricultural Report) will guide to symptoms and prevention:

"The bird which is a victim to this disease, observes M. Pasteur, loses its strength, and its wings droop. The feathers on its body rise, and make it look like a ball. An unconquerable sleepiness overwhelms it. If it is compelled to open its eyes, it appears as if awakened from a profound sleep, and soon closes its eyelids again. Frequently it dies in mute agony without having changed its position. If it happens to move its wings for a few seconds, it is with great difficulty. This disease is caused by a microscopic organism, which M. Pasteur has bred in a suitable manner, and with which he has inoculated Guinea pigs and fowls. The inoculation of the pigs did not always produce death, but did produce an abscess, and fowls inoculated with the contents of this abscess soon died. A few drops of a culture of this microbe placed on a piece of bread or meat fed to the fowls is sufficient to cause the infection to enter the intestinal canal, where the little organism multiplies in such great quantities that the excrement of the fowls thus infected kills others which are inoculated with it. These facts, M. Pasteur says, permit us easily to account for the manner in which the disease is propagated in poultry yards.

"Evidently the excrements of the sick birds are the great cause of contagion. Nothing can be more easy to arrest this than by simply isolating the birds for some days, by washing the yard with an abundance of water, and especially with water acidulated with a little sulphuric acid, which easily destroys the microbe, and by removing all the manure before admitting the birds again. All cause of contagion

will have been removed during this period of isolation, because the birds already attacked will have died, so rapid is the disease in its action.

"By a certain change in the culture of this microbe its virulence may be diminished, and while the fowls inoculated with the most virulent virus are all killed, those infected with the diluted virus sicken but do not die. If they are allowed to recover, and are again inoculated with the more infectious virus, the injuries produced are local, and do not cause death. Chicken cholera is, then, of the character of those virulent diseases which do not repeat themselves. Suppose that this microbe of the diluted virus may be fixed in its proper variety, according to M. Pasteur, and that we are not always obliged to have recourse to its original propagation when we wish to use it, it may be made to serve as a veritable vaccine, transmissible from animal to animal as the vaccine of variola is transmissible from man to man."

The five circulars issued by the Board of Health since its superintendence of the law as to the contagious diseases of animals, will be found together in the present Report of the State Board of Agriculture, and are also to be had in leaflet form.

SUGGESTIONS TO HEALTH BOARDS.

In addition to other directions, to be found in this and other yearly Reports of the State Board, it may be added—

I. Let each Township Committee, at its usual meetings, when the assessor is present, sit also as a Health Board and enter the fact in the township health book, together with any item of business.

II. Whenever new officers are elected, there should at the first meeting be an entry in the health book of the names of the Health Board as thus made.

III. Where there is no township physician as a member of the Board, some of the Boards have invited some adjoining physician to act as their adviser, but it is better to elect a medical member.

IV. Carefully examine all laws relating to the construction of Local Boards and their duties. Correctness and promptness of action are most important. The failure of a law is oftener in delay or mistakes in its administration, or in technical errors, than in the defects of the law.

V. The Reports of the State Board of Health, as sent, are not the property of individuals, but of the Board. The keeper of the town health book should keep control over them, and see that when loaned to others they are returned to him, and passed over into the hands of the succeeding officer.

VI. We ask the same promptness in future annual reports as in these, and that the few who have failed to organize, or to make full report, will fully arrange at the first meeting of the Township Committee, and notify us.

VII. As the returns of marriages, births and deaths so much indicate the progress and health of communities, and are essential in the study of local conditions, all Boards should insist upon prompt returns, and report to the Secretary of State any omissions. It is, too, the legal right of every citizen to have such a record. Any neglecting returns are liable to suit at law.

VIII. All communications should be addressed "State Board of Health," or "Bureau of State Vital Statistics," State House, Trenton.

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OF THE NEW JERSEY STATE BOARD OF HEALTH.

No. 1.	1st Annual Report of the	Registrar-General	of England,		1839.
2.	2d	do.	do.		1840.
3.	3d	do.	do.		1841.
4.	4th	do.	do.		1842.
5.	5th	do.	do.		1843.
6.	6th	do.	do.		1844.
7.	7th	do.	do.		1845.
8.	8th and 9th	do.	do.		1847–48.
9.	10th	do.	do.	Abstracts of,	1847.
10.	11th	do.	do.	do.	1848.
11.	12th	do.	do.	do.	1849.
12.	13th	do.	do.	do.	1850.
13.	14th and 15th	do.	do.	do.	1851–52.
14.	16th	do.	do.	do.	1853.
15.	17th	do.	do.	do.	1854.
16.	18th	do.	do.	do.	1855.
17.	19th	do.	do.	do.	1856–57–58.
18.	22d	do.	do.	do.	1859–60–61.
19.	25th	do.	do.	do.	1862–63–64.
20.	28th	do.	do.	do.	1865–66–67.
21.	31st	do.	do.	do.	1868–69–70.
22.	34th	do.	do.	do.	1871–72–73.
23.	37th	do.	do.	do.	1874–75–76.
24.	40th and 41st	do.	do.	do.	1877–78.

(For additional numbers see page 212, number 246.)

25. Report of the Cholera Epidemic in England, 1866.
26. Supplement to 25th Annual Report of Registrar-General, 1851–60.
27. do. 38th do. do. 1861–70.
28. Report of Medical Officer of Privy Council, 1858–62.
29. do. do. 1863–64.
30. do. do. 1865–66.
31. do. do. 1867–70.
32. do. do. 1870–73.
33. Report of Medical Officer of Privy Council and Local Government Board, England, 1873–74.
34. Report of Medical Officer of Privy Council and Local Government Board, England, 1875–76.

No. 35. Supplement, with Report of Medical Officer, 1876.
36. Reports of Local Government Boards, 1878–79. See No. 744.
37. Dictionary of Hygiene. Alex. W. Blyth.
38. Parke's Practical Hygiene. (5th Edition.)
39. Public Health. American Public Health Association. Vol. 1st.
40. Public Health, Amer'n Pub. Health Association. Vol. 2d.
41. do. do. do. Vol. 3d.
42. do. do. do. Vol. 4th.
43. do. do. do. Vol. 5th.
44. Hygiene and Public Health. Buck. Vol. 1st.
45. do. do. do. Vol. 2d.
46. Water Supply of Cities and Towns. Humber.
47. Hygiene of U. S. Army, 1875.
48. Traite D' Hygiene Publique et Privie. A. Proust.
49. M. Levy—Traite D' Hygiene. Vol. 1st.
50. do. do. do. Vol. 2d.
51. Sanitary Engineering. Denton.
52. House Drainage and Water Service. Bayles.
53. Air and Rain. Dr. R. A. Smith.
54. Ozone. Dr. C. Fox.
55. Sanitary Subjects. Halton.
56. Emergencies, and How to Treat Them. Howe.
57. Lectures on Medical Jurisprudence. Ogston.
58. Forensic Medicine and Toxicology. Woodman & Tidy.
59. Sanitary Record. Oct., 1877–June, 1878.
60. do. July, 1878–June, 1879.
61. do. July, 1879-——, 1880.
62. Reports of the New Jersey State Board of Health and Addresses.
63. The Condition of Nations. Edwin W. Streeter.
64. Sanitary Record. 1880–1881.
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69. Reports and Addresses of State Sanitary Commission, 1866.
70. The Restoration of Health. Inman.
71. Cholera Epidemic of 1873 in the United States.
72. Report of Sanitary Commission of Massachusetts, 1850.
73. Reports of the New Jersey State Board of Health, 1877–80.
74. do. do. 1877–81.
75.
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78.
79–98.
99. Health of Newark for Twenty Years. Holden.
100. Dangers to Health.
101. Diseases of Modern Life. Richardson.
102. Ministry of Health. Richardson.

No. 103. Health and Disease. Dr. E. Smith.
104. The Maintenance of Health. Fothergill.
105. Health and Education. Kingsley.
106. Lectures on Public Health. Dr. Mapother.
107. Health, and How to Promote It McSherry.
108. Hand Book of Hygiene and Sanitary Science. Wilson.
109. Manual of Public Health. Hart.
110. Filth Diseases, and Their Prevention. Dr. Simon.
111. Hall on Drowning.
112. Manual of Surgical Emergencies. Swain.
113. Mothers' Work.
114. Muscular Power. Flint.
115. Mother's Register.
116. Minor Surgery and Bandaging. Heath.
117. Air, and Its Relations to Life. Hartley.
118. Hand Book of Rural Sanitary Science. Dr. Marsh.
119. Sanitary Work. Slagg.
120. Sanitary Arrangements for Dwellings. W. Eassie.
121. The Sanitary Drainage of Houses and Towns. Waring.
122. Sanitary Examinations of Water, Air and Food. Fox.
123. Hand Book of Rural Sanitary Science. Dr. Marsh.
124. The Practice of Sinking and Boring Wells. Spon.
125. Hand Book of Nursing.
126. The Cottage Hospital. Burdett.
127. Food, Its Adulterations and the Methods for Their Detection. Hassall.
128. Manual of Practical Chemistry. Blyth.
129. Fuel, Its Combustion and Economy. Clark.
130. Alchohol as a Food and Medicine. Hunt.
131. Watson's Manual of Calisthenics.
132. Watson's Hand Book of Calisthenics and Gymnastics.
133. Hygiene of the Voice. Durant.
134. The Medical Adviser in Life Assurance. Sieveking.
135. The Ten Laws of Health; or, How Diseases are Produced and Prevented. Dr. Black.
136. The Insurance Blue Book, 1875. Hine.
137. Mortuary Statistics of Mutual Life Insurance Company of New York.
138. Department of Agriculture—Diseases of Cattle in the United States.
139. Cattle Plague Inquiry, England, 1865–6.
140. A Manual of Veterinary Sanitary Science and Police. Vol. I. Fleming.
141. do. do. do. Vol. II. do.
142. Pleuro-Pneumonia, Commonwealth of Massachusetts.
143. Veterinary Medicines. Dun.
144. Commissioners of Agriculture, Report Diseases of Cattle in United States, 1869.
145. Commissioners of Agriculture, Report Diseases of Cattle in United States, 1869.
146. Sheep Husbandry.
147. Diseases Among Swine and Other Domestic Animals, 1879.
148. Diseases of Live Stock. Tellor.
149. Contagious Diseases of Swine and Other Domestic Animals, 1880.

No. 150. The Four Bovine Scourges. Walley.
151. Trichinæ and Trichinosis. Glazier.
152. Manual of Cattle Feeding. Armsby.
153. English Cattle Laws.
154. Journal of Royal Agricultural Society, England.
155. Contagious Diseases of Domestic Animals, 1880–1.
156. Lung Diseases of Cattle. Jas. Law.
157.
158.
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161.
162–179.
180. Tenth Report Local Government Board, 1880–81.
181.
182.
183.
184.
185.
186–201.
202. Old Southwark and Its People.
203. The Analyst. Vol. V.
204. Sanitary Engineering. Latham.
205. Proceedings of Sanitary Engineers. Vol. 6. England.
206. Epidemic Pestilences. Bascome.
207. Trans. of Sanitary Inst. Great Britain.
208. Purification of Water-Carried Sewage. Robinson and Mellis.
209. The Plumber, and Sanitary Houses. Hellyer.
210. Warming and Ventilating Buildings. Hood.
211. Parasites of Man and Animals. Cobbold.
212. Healthy Dwellings. Galton.
213. Sanitary Care and Treatment of Children. Johns Hopkins University.
214. Lectures on State Medicine. De Chamont.
215. Brain and Nerve Exhaustion. Dowse.
216. Bacteriæ. Maguire.
217. Hints for Health. Stocker.
218. Fasting and Feeding. Winslow.
219. Pollution of Rivers. Buckland.
220. Model By-Laws for Sanitary Authorities.
221. English Army Medical and Health Reports, 1877–78.
222.
223.
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226.
227–245.
246. 42d and 43d Annual Report, Registrar-General of England, 1879–80.
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No. 250.					
251.					
252–299.					
300.	Annual Report, Board of State Charities of Massachusetts, 1865.				
301.	2d	do.	do.	do.	1866.
302.	3d	do.	do.	do.	1867.
303.	4th	do.	do.	do.	1868.
304.	5th	do.	do.	do.	1869.
305.	6th	do.	do.	do.	1868–69.
306.	7th	do.	do.	do.	1869–70.
307.	8th	do.	do.	do.	1870–71.
308.	9th	do.	do.	do.	1871–72.
309.	10th	do.	do.	do.	1872–73.
310.	11th	do.	do.	do.	Jan., 1875.
311.	12th	do.	do.	do.	1876.
312.	The Public Charities of Massachusetts during Century ending Jan. 1st, 1876.				
313.	13th Annual Report, Board State Charities of Massachusetts, 1875–76.				
314.	14th	do.	do.	do.	1877–78.
315.	15th	do.	do.	do.	1878.
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406. Physiography. Huxley.
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413. How to Prolong Life. Evans.
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415. Dirty Dustbins and Sloppy Streets. Boulnois.
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517. Letters of Edward Denison.
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519. Brain Work and Overwork. Wood.
520. The Throat and the Voice. Cohen.
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532. The House and Its Surroundings.
533. Exercise and Training.
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541.	Manual of Heating and Ventilation. Schumann.	
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543.	What Every Mother Ought to Know. Ellis.	
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550.	Whose Fault is It?	Popular Sanitary Tracts.
551.	The Worth of Fresh Air.	do.
552.	Washing the Children.	do.
553.	"The Black Hole" in Our Own Bed-rooms.	do.
554.	How to Manage a Baby.	do.
555.	The Health of Mothers.	do.
556.	Little Mary's Illness.	do.
557.	The Cheap Doctor.	do.
558.	The Power of Soap and Water.	do.
559.	The Value of Good Food.	do.
560.	The Use of Pure Water.	do.
561.	Lost and Found.	do.
562.	A Day in the Country.	do.
563.	Going to School.	do.
564.	The Inspector.	do.
565.	The Mother.	do.
566.	The Bride's New Home.	do.
567.	Remarks on Woman's Work.	do.
568.	Household Troubles.	do.
569.	How Do People Hasten Death?	do.
570.	Sanitary Defects.	do.
571.	The Sick Child's Cry.	do.
572.	Never Despair.	do.
573.	On Dress.	do.
574.	Mrs. Findlay's Tea Party.	do.
575.	Sowing the Seed.	do.
576.	A Model Wife.	do.
577.	The Advantage of Warm Clothing.	do.
578.	Wasps Have Stings.	do.
579.	The Mischief of Bad Air.	do.
580.	About to Marry.	do.
581.	Work and Play.	do.
582.	What Can Window Gardens Do For Our Health?	do.
583.	The Influence of Wholesome Drink.	do.
584.	The Sanitary Duties of Private Individuals.	do.
585.	Measles.	do.
586.	The Secret of a Healthy Home.	do.
587.	The Massacre of the Innocents.	do.
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597. Hygiene and Education of Infants. Walton.
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860. do. do. Kentucky.
861. do. do.
862. do. do.
863. do. do. Illinois.
864. do. do.
865. do. do. Michigan. See 1450.
866. do. do. Wisconsin.
867. do. do. Iowa.
868. do. do. Colorado.
869. do. do. Minnesota.
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871. do. do.
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951. do. do. 1861.
952. do. do. 1862.
953. do. do. 1863.
954. do. do. 1864.
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1494.	5th	do.	do.	do.	1874.
1495.	6th	do.	do.	do.	1875.
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PAMPHLETS.

[Pamphlets are marked in numbers, with a period before them.]

No. .1 Pamphlets on Small Pox.
.2 Animal Vaccination.
.3 General do.
.4 Diphtheria.
.5 Disinfection.
.6 Scarlet Fever.
.7 Malaria.
.8 Yellow Fever.
.9 Lessons on the Prevention of the Spread of Fevers. Ashendea.
.10 Anthrax Contagion. Russell.
.11 Facts about Fevers. Page, M. D.
.12 Domestic Sanitary Works. Rawlinson.
.13 Ladies' Sanitary Association.
.14 Sanitary Progress—Circulation or Stagnation. Chadwick.
.15 Fermentation and Disinfection. Dake.
.16 Alms House Regulations, Camden Co., N. J.
.17 Annals of Medical Progress. Toner.
.18 Plan of Sewerage, Baltimore. Latrobe.
.19 Health and Healthy Homes. Loring.
.20 Sewerage and Drainage.
.21 do. Treatment. Coventry.
.22 Drainage, Sewage, Health, &c., New Orleans.
.23 Ladies and Sanitary Science.
.24 Ventilation of Sewers.
.25 New York Sanitary Society.
.26 Durham System of House Drainage.
.27 Domestic Sanitation, &c., New Orleans.
.28 Sewerage of Memphis. Waring.

No. .29 Disposal of Sewage. Rochdale.
.30 Sewerage Works of Croyden.
.31 Sanitary Works Abroad—Paris and Berlin.
.32 New York Sewers. Fowle.
.33 Hints on House Drainage.
.34 New Jersey Drainage Acts.
.35 Underdrainage. Denton.
.36 Geology of Hudson River. Russell.
.37 Soil and Drainage of Hudson County. Ward.
.38 Land Drainage. Reeve.
.39 Main Drainage of London. Basalgette.
.40 Sanitary Engineering. Cain.
.41 Regulations of House Drainage. Field.
.42 Sewage Disposal—Downward Filtration. Denton.
.43 Sewage Poisoning. Blake.
.44 Coventry Sewage Works.
.45 Health and Sewage of Towns—Society of Arts.
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.50 Reports by Rudolph Herring, Civil and Sanitary Engineer.
.51 Fortnightly Review on Vaccination.
.52 New York State Board Circulars.
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.61 Natural Water Supply, Sewage and Health, London.
.62 Water. Chittenden.
.63 Croton Water.
.64 Plain Words about Water. Church.
.65 Water Pollution. Green.
.66 Soil and Water Pollution. Reynolds.
.67 Proper Water Supply. D. DeHart.
.68 Boston Water Supply. Nichols.
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.75 Domestic Poisons. Carr.
.76 Adulterations of Food.
.77 Adulteration of Drugs.
.78 Laws as to Adulterations of Food and Drugs.
.79 Adulterations of Food—Medical Journal.

No. .80 Color Blindness. Jeffries, M. D.
.81 Light, as related to Disease.
.82 American Public Health Association, 1880–81.
.83 Cleanliness, Health, Wealth. New Orleans.
.84 New Orleans Report and Addresses.
.85 What the State owes the People, and what the People owe the State. Brooks.
.86 State Medicine.
.87 Healthy Homes.
.88 Deeds and Needs of Hygiene. Hunt.
.89 Hygiene of Emigrant Ships. Turner.
.90 Enteric Fever Outbreaks. Russell, Glasgow.
.91 Adulteration of Milk—The People vs. Schrumpf.
.92 Education and Health Circulars.
.93 Medical Society of Penna. on Hygiene.
.94 Food and Clothing.
.95 Food and Feeding. Sir Henry Thompson.
.96 Exercise and Training. Lee.
.97 Muscle Beating. Klemm.
.98 Study of Temperaments. Wilkes.
.99 Dress—Its Sanitary Aspects. Roth.
.100 Moral and Social Aspects of Health. Ackland.
.101 The Religion of Health.
.102 Medical Hints as to the Singing Voice. Browne.
.103 Physical Education and Hygiene. Hitchcock.
.104 School Life, as affecting Sight and Figure. Liebreich.
.105 Sanitary Condition of School Houses. Nichols.
.106 Free Parks and Camps for City Poor. Toner.
.107 Pathogeny of Diphtheria. Curtis and Satterthwaite.
.108 Septicæmia from Human Saliva. Sternberg.
.109 Abnormal Entozoa in Man, and Sequel. Lockwood.
.110 Filaria Sanguinis Hominis in South Formosa.
.111 Coroner Law, Massachusetts.
.112 New Jersey Medical Legislation.
.113 Sanitary Legislation in England and New York.
.114 Manual of Health Laws, New York State.
.115 Local Authority of Glasgow against Young.
.116 Sanitary Legislation.
.117 Boards of Health. Stephen Smith.
.118 Medico-Legal Society, Massachusetts.
.119 Laws on Health in Massachusetts.
.120 English Model By-Laws on Health.
.121 Longevity. Gardener.
.122 Origin of Species. Huxley.
.123 Various Catalogues.
.124 Medical Profession and Public Health. Deshler.
.125 Suggestions on Rural Hygiene.
.126 Sanitary Appliances.
.127 Mosaic Sanitary Code.
.128 do Code of Sanitation. Hart.

No. .129 Public Health, New York. Ewer.
.130 National Sanitation. Lee Hardy.
.131 The Sanitarian.
.134 Medical and Health Lists of Names.
.135 Life Assurance.
.136 Fair and Sanitary Exhibit.
.137 Various Specimens of Sanitary Codes and Ordinances.
.138 International Sanitary Exhibit.
.139 Boston Report of Board of Health.
.140 Smithsonian Meteorological Reports.
.141 Thirty Specimens of Local English Health Reports.
.142 Specimens of American City and Township Reports.
.143 International Medical Abstracts.
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REPORT

OF THE

BUREAU OF VITAL STATISTICS.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By **EZRA M. HUNT, M. D.,**

Medical Superintendent of State Vital Statistics.

YEARLY OUTLINE AND SUMMARY.

The consideration of the value and methods of vital statistics has been prominent the last year, from the fact that the attention of statisticians and others has been so officially called thereto. Gen. F. R. Walker, in his superintendency of the United States Census, early arranged for the securement of a more complete return of mortuary statistics. He, in common with other authorities, recognizes that the perfecting of systems must depend upon the constant gathering made by the States.

The National Board of Health regards the accurate and frequent collection and tabulation of such returns so indispensable as to give to it great prominence in the administration of public health.

The American Association for the Advancement of Science, through a committee, of which the able statistician, Hon. E. B. Elliott, was chairman, recently made special communication to the American Public Health Association as to the practical importance of the subject. This association is now giving full attention thereto, and a preliminary report by Dr. Elisha Harris shows that close attention is being given to the study of methods, and the best systems for such analyses as shall guide us in deductions significant as to the limitation of disease.

Thus far the chief effort of this Bureau has been to secure accuracy, uniformity and universality of returns; to have such indexing and transcription as will render them easily accessible for legal and vital purposes, and to make from them such tabulations as point to the locality and causes of disease. There are respects in which the study of marriage and birth returns are not less important in deciding indications as to economical and vital questions. There are also many deductions as to disease, in its relations to birth, nationality, parentage, for which the material is fast collecting, but as to which conclusions, derived from too few numbers, might be erroneous.

The comparative success which has attended the efforts to secure

these returns, is shown by their steady increase, while the per capita expenditure is not as great as when there was no attempt at classification or study. It is only as to the returns of births that our methods do not seem to be perfected. So far as vital study is concerned, we are able from those obtained, and from the deaths under one year of age, to compute allowances. But it would be better if the returns themselves were more complete. As it is they are several thousand in advance of those under the last system, besides being accompanied with details of value in vital study. Until our governing authorities, and especially those of our cities, come to know that proper sanitary care and police requires that the number of young children be known, in order to limit and protect from disease, they will be insensibly contributing to the general death rate. For, in order to limit disease and to promote health and comfort, especially with the wage population, we must know the kind and amount of material which disease has at hand. For, be it known that the diseases which go about killing little children, depend upon that neglect and ignorance which make it easy for such diseases to destroy. These are enemies to public thrift, and not the peculiar study of promiscuous philanthropists.

We find in the State no tendency to resist a law which has its foundations in a decent care of human life. It is not officious for the State, in the case of a marriage, to claim that it have the recorded evidence thereof, with such appended facts as, in the judgment of those who have made the civic care of population a study, are deemed desirable. The former plan, by which the performer of the ceremony was required to pay a shilling and make the record, and the State besides collected a return at a cost of about twenty-five cents, was much simplified by the present law. Facts as to illegal marriages and as to various divorce laws in other States, show how wisely, both for legal and moral purposes, and for protection from hasty and clandestine marriages, has been a system of registration.

As to births, the trouble arises from negligence and delay rather than from intent. Some at first were disposed to question the right which a State has to enforce a duty without compensation. This duty has been imposed by a law on the statute book for 30 years, and the principle is acknowledged in many cases, where lawyers, who are apt to protect their own legal rights, are required to perform services for which no direct pay is provided. It would be easy to show that incidental benefits accrue to medical men from all laws that

look to this kind of guardianship over such vital conditions of population as they bear relation to.

As to deaths, the common sentiment is that the death and the cause of death of every person should be authenticated. Because of this, many countries and some States allow burial only by licensed undertakers. Our present State method is fraught with as little trouble as accuracy will permit, and is easy to those who on their visit provide for the securement of the necessary certificate.

NOMENCLATURE.

In most of the returns of death there is evident carefulness of diagnosis, or a note showing some doubt or complication which is recognized. We invite the attention of all students of statistics to the data already on hand, as showing how informatory these records are, if for instance any one physician is disposed to abound in "general debility," "cancer of liver," pyæmia or septicæmia (without locality), congestive or gastric liver or other doubtful term, the return itself comes to be eliminated and either is dropped from the vital tabulation or loses its significance in the multitude of numbers. As the prominent principles of study have already been analyzed in the two previous reports, we need not recount them here.

CLIMATOLOGY.

As this is the subject of a separate paper in this report, we need only direct attention thereto. We hope that hereafter the Local Boards of our cities will avail themselves of such weekly and monthly returns as will enable them to know the relation of temperature, humidity, etc., to disease. It is our work to collect these relations over large areas and for longer intervals. It is for others to trace the immediate effects and so learn to anticipate as well as to record. A proper forecast of the health officer in large cities, watches effects and provides for an increased sickness rate in certain parts of a city, under certain approaching weather conditions, as intelligently as does the seaman who reads the weather indications for our northern lakes.

RELATIONS OF LOCAL BOARDS OF HEALTH TO VITAL STATISTICS.

Some of our Local Boards, with commendable care, help to secure the vital returns, and seem to have some conception of such facts as relating to public health. But it is also true, that there is little pro-

vision for such study in many of our cities. Newark, for instance, with its 136,508 inhabitants, has no weekly or monthly or quarterly analysis of its vital statistics. All yearly or half-yearly summaries are furnished us and studies can be made upon them. But such a city should not be content unless it secured the service of some statistician, who, a day in each month, should study the indications and give such warnings or instructions as could not but be precautionary. The same is true of Trenton. Paterson gives the most intelligent study of this kind, but also needs a fuller analysis of the meaning of localized sickness and death rate. No one can review similar short period studies of Glasgow without seeing why it is that the commercial and business interests of the cities require such administration.

CENSUS.

The death rates for last year were calculated on the basis of the census of 1880, and those of 1879 recalculated to conform thereto. As the returns then in hand were not the final ones, it has been necessary to review and recompare. No changes are found that require adjustment, although we have given the revised returns in the present tables.

The greatest difference is that of 108 in Newark, which, with its large population, does not sensibly disturb the percentage. Some changes in areas will be noted in foot-notes in connection with the tables.

REMITTENT FEVER.—INTERMITTENTS.—MALARIA, ETC.

The results of the type of diseases known as malarial, do not generally find full record under this division. In general, it is said that these diseases are not usually fatal, but produce that chronic breaking down or condition of malaria which tells on the future and shortens the period of active life, as often that of actual years. But in reviewing our record we find that the unusual prevalence of malaria for the two years previous to July, 1881, has quite prominently recorded itself in the death rate. All this class of diseases promotes congestion of the internal organs. The spleen often becomes permanently enlarged and the liver embarrassed in its important functions in aid of digestion. Were there no question of comfort or economy involved, we would need to give great prominence to the morbific influence of malarial diseases. There is no disease more

under our control, both as to its prevention and limitation. Drainage for health, and the use of proper precautionary care, and the continued preventive treatment of those once affected, are capable of greatly limiting this malady. The recurrence in special seasons only means that an existing evil is not always equally potent, but awaits the favoring influences of certain conditions of weather. Our power of preventing is in removing that one of the factors over which we have control. To hesitate or doubt because we do not govern both and all, is merely to provide material for the forces of diseases. The number of deaths recorded this year from malarial disorders is 431, being an increase of 138 over 1879–80, and of 163 over 1878–9.

TYPHUS FEVER.

We hope seldom to have occasion to include this filth fever in our list. The special case of the Camden County Alms House, is already noticed; besides this, several single cases are reported from other parts of the State. These had been directly exposed to the contagion in Philadelphia, in Camden county or New York city. The type seems to have been distinctly recognized, and should lead our large cities to great precaution, and to the requiring of an early report of such cases. Two of the reported cases were in Camden, one in Trenton, three in Newark, two in Jersey City, three in Gloucester, Somerset and Union counties, respectively. Some of the cases are so positively stated as almost to preclude an error of diagnosis. It is so natural for many an immigrant to travel on foot from New York to Philadelphia, that we may easily obtain the disease from abroad, as well as manufacture it at home. As it is one of the most dreaded of pests, the warnings of the last year should not pass unheeded.

TYPHOID FEVER.

The 324 cases of 1879, and the 373 cases of 1880, have multiplied to the 574 cases of 1881. Of those for this year, 50 must be deducted for typhus fever, which is always marked in our office schedule. This may not be considered a large rate for a State having so many crowded areas of population. But the fever is so unmistakably a manufactured and preventible disease, and so often removes those in the prime of life, as to need the astute care of Boards of Health. Over 20 cases in New Brunswick seemed to have been directly traced to one locality and to a pump-water supply. The

poison of it is so distinctly specific, that even typho-malarial fever, so-called, has no distinct lesions, and is only thus too often vaguely named because a malarial atmosphere seems to add an additional complication in treatment. To it we perhaps must attribute part of the increase of the last year. But it seems to us wise that practitioners should keep closely in view the distinctiveness of type, and more and more avoid the use of the word typhoid to describe low forms of other disease. All the more, because it is so doubtful whether quinine is of much value in typhoid fevers, and it is so easy to be tempted to its use by an over-recognition of a malarial element. The remissions of pulse and of temperature may require great care to record the distinctiveness, but are certainly not those of malarial periodicity. More than all do we need to recognize the relations of surroundings to the welfare of families, to guard all secretions against any possible infection, and to have a hygienic code in application which shall prevent the spread of the fever.

SMALLPOX.

Last year we had occasion to note a slight epidemic of smallpox in Salem, and a more extended one in Camden. The year before there had not been a death therefrom in the State. This year we have had notice of it at several points, and as even yet prevalent in many places. Camden city and Hudson county, by reason of their railroad connections, have had enough cases to insure a supply for the State. Testimony is coming to us from various places as to what active dealing with first cases, on the part of physicians and Boards of Health, can do to stay the disease, and how a hesitating Board can talk and wait until the fire is under headway. Vaccination has been and is being practiced in the State as never before. Revaccination is also approved, and seems to have had effect in an unusual percentage of cases. Physicians and Local Boards are looking with some care into all the phenomena which experience is recording, but it is as yet premature to reason from isolated cases. There is no weakening of confidence in the protective power of vaccine virus. There is a healthful anxiety to be assured of its purity, and a caution which is misinterpreted when it leads to suspicion on the part of the laity. It is only salutary because it means that medical men intend to be assured as to the purity and value of the material they use. The patient has, at least, as good security as to the virus used, as he has

that the prescription made is the right medicine. How far the law of a periodical visitation of such a disease as this may be said to determine its frequency, is not yet fully apparent. But it is far more probable that the neglect of vaccination about every six or seven years, brings out into public life (which school life is to the child) sufficient swarms of unprotected ones to furnish a tempting supply for every vagrant contagion, and to make epidemics out of sporadic cases. We only sigh for the day when public opinion will not need to wait for such warnings. *Is it not possible to have at each public school building in the State an annual vaccination day, on which, with proper provision made therefor by law, all can be vaccinated, or those revaccinated who may desire it?* The Board issued an early circular of warning and direction, and by correspondence and otherwise has done all in its power to limit the disease. Besides the 144 deaths recorded for Camden county, up to July 1st, there had been 110 deaths in other parts of the State. Of these, Hudson county had 70. Some of these date so far back as January, and show that Hoboken and Jersey City were already in process of epidemic. It has seemed to us that the work of the county Board is not allowed to be as radical as it should be in such cases, probably for want of funds or because permanent hospital accommodations are not at hand. A corporation ought to excuse itself for not putting out a fire, because it is expensive, just as plausibly as it excuses delay for this cause in heading off an epidemic. It may cost active outlay, but all this is economy as compared with the cost of an epidemic. We draw especial attention to the local report of Egg Harbor City and that of Rahway, as illustrating some of the phases of the disease, and methods of dealing with it. One case of death from vaccination is reported. Also one from a pin scratch. The one patient was aged 75 and the other 63. Each of them had erysipelas. All who see fit to argue therefrom that vaccination and pins must be given up may carry on their high debate alone.

SCARLET FEVER.

This disease registered 627 deaths in 1878–79, 573 in 1879–80, and 499 in 1880–81. There is no good reason why a greater decrease should not be secured. It has come to be more generally recognized that the skin secretion and desquamation has much to do with the spread of the disease. A microscope shows that the epidermis and scarf skin is shed or thrown off, and to a degree is charged with the

virus of the disease. For this reason the early use of vaseline or other oil or mucilage is urged. After scarlet fever has occurred in a house there is need of the most thorough airing of all clothing and general house cleaning of all exposed rooms. (See Household Circular, p. 260, of Report of 1880.)

MEASLES.

This disease numbered 87 cases, 77 cases and 70 cases, respectively, in the last three years. While it is not often immediately fatal, experience shows how it may become a serious and fatal malady. In 1862–63, it was very fatal in the army, and we had occasion to see it in a severe form. It often leaves the lung tissue impaired and serves as the start for tubercular deposit. As it is often treated without medical attendance, all should know the subsequent risks to which it gives rise, and how the lungs are left susceptible to the slighest changes. Children need to be guarded from exposure for a time.

Rötheln, or German measles, as it is often called, is reported as a cause of death in a case in Passaic county. It is a sort of rash, so like measles as often to be mistaken for it, and needs reference here only because it may at any time become epidemic, and should be recognized as quite distinct.

WHOOPING COUGH.

This proves seriously fatal in some foreign countries, and with us is greatly influenced by the season of the year or by states of weather. We are satisfied that it is often too lightly viewed in households, and leads to convulsions or other brain or nervous symptoms, which impair vitality long after the cough has ceased. The sputa or spittle should never go into the handkerchief, but into some disinfectant solution, as it conveys the disease. The deaths from it this year were 119, as against 277 of last year, and 137 of the year before.

DIPHTHERIA.

This continues to be, perhaps, the most formidable of children's diseases, and not infrequently claims victims in later life. In the last report it was made the subject of some special description, pages 8–13. The view seems confirmed that it is generally local before constitutional, and is always derived outside of the body. Its particle is

inoculable, and its conveyance by contagion indisputable. As it is not volatile, its transmission is that of near proximity or of exposure to infected garments or objects. It is one of the diseases greatly within the control of active hygienic and preventive measures. We have, the past year, known the elder daughter of a family, who ought to have been restrained by law, if need be, from going home, to convey it to four children, so that all five died. One or two of the children were taken to a physician in a way to expose others. Law must be kind but definite in dealing with such cases. 1,100 died of this disease in 1878–9; 873 in 1879–80, and 1,128 in 1880–81.

DIARRHŒAL DISEASES.

We must urge upon Local, and especially city Boards of Health, a closer study of these diseases. In certain districts of almost every large city they are the signs of how the population is suffering from low-race vitality or from bad air or water or food. The children are the delicate plants that first wither, because placed in an unwholesome medium or starved of the nutriment which their bodies require. The sudden flux is but the rebellion of nature, and too often ends the life before hygienic measures can be secured. Every physician knows that he seeks the cause as earnestly as he seeks to give the remedy. The fact that the treatment is so often in change of air or food is merely a certificate that the sickness is a casualty. If city Boards will accept such evidences it will lead to a closer attention to prevention.

Dysentery, which is specially marked in the office schedule, caused several deaths this year. It has, of late years, seldom prevailed in this State as a complication of remittent fever. When so prevailing it is apt to prove very fatal. This year there were more cases than usual in Mt. Holly and vicinity, and of a more serious type than usual. A few sporadic cases were reported elsewhere. When occurring in small children it is classified with diarrhœal diseases.

CONSUMPTION AND OTHER LUNG DISEASES.

As a special paper directs attention to the causes of this disease, we have here only occasion to refer to it. Statistics, rapidly collecting, will enable us ere long to show what counties and what cities have the largest death rates from this disease, and so assist in determining as

to local or avoidable causes. The lungs, from their intimate relation to the outer air and the whole blood circulation, form the most vital point of attack, as well as of life. Pneumonia is a common disease, while catarrhal, bronchial and asthmatic affections are among the most troublesome as well as frequent. There is great need that our population be directed to the means of personal protection. It is an experience that those who do their breathing most through the nose, instead of through the mouth, are not so likely to be affected by dust, by close atmospheres or by sudden changes. Hence those that have to talk are more exposed than those who may be silent. As the condition of the skin has much to do with the freedom and action of the lungs, it should be kept clean, so as not to be clogged with its secretions, and should be protected from drafts or sudden changes of air. This applies especially to the chest and body. It is because flannel is so good an equalizer of heat and air that it is valuable as a garment. So-called chest protectors are overrated, while too many forget that the lungs are as near to the back as they are to the breast.

BRAIN AND NERVOUS DISEASES OF CHILDREN AND ADULTS.

We have not yet sufficient State data to determine whether this class of diseases is especially prevalent. Statistics elsewhere seem to point out many indications as to too great pushing of children, and too great self-pushing by adults. The educational problem has no more important consideration than that which attempts to estimate what the school should be—what it should do in order to furnish to the State a healthful citizen. The time has passed when either the educator or the statesman can cast aside the hygienic view. We must ask whether brain and nervous diseases are being made by school life, or whether our American reputation for nervousness or early brain lesion is an acquired disability.

The deaths from the brain and nervous diseases of children were last year 1,642, being an increase of four over 1879–80, and a decrease of five from 1878–79.

The deaths of adults from similar causes were 1878–79, 1,314; 1879–80, 1,347; 1880–81, 1,502. A study and comparison of the tables will show details.

In respect to diseases of the heart, circulation and to urinary diseases we do not need to make additional remarks to those of former years. The comparative deaths from these for three years

have been as follows: heart and circulation, 1878–79, 972; 1879–80, 982; 1880–81. The record for urinary diseases is as follows: 1878–79, 558; 1879–80, 516; 1880–81, 608. In the office schedules all those relating to the bladder and genital apparatus are separately designated.

HYDROPHOBIA.

The occurrence of cases of hydrophobia at several localities in the State is worthy of attention. It was alleged, both in the winter of 1879–80 and that of 1880–81, and the summer intermediate, that an unusual number of cases had occurred in this country. It was attributed to various causes, such as the frozen state of the streams in winter, the extreme heat of the summer, etc. At one time Dr. Farr noted in England an increase of the disease not to be accounted for by any increase in the number of dogs. Six deaths from this cause appear in our Report of this year, each in different localities. Evidence has come to us of rabies among animals in other parts of the State, where there were no cases fatal to men. Dr. Rogers, one of our veterinarians, says that the disease was enzoötic in the lower part of Gloucester county, adjoining Delaware river, in the early months of this year, and thirty or more dogs died or were killed. It is so direful a malady as to deserve special study as to its causes, its development, and the circumstances which favor its prevalence in the lower animals. We draw attention to the special law of the State as to Protection against Mad Dogs, page 25 Revised Statutes.

CANCER.

This disease claims so large a number of victims, that its diagnosis needs to be carefully watched, and its symptoms closely defined. A careful review of the cases leads us to believe that such terms as carcinoma of the liver, etc., are used without full evidence. There are enough, however, distinct and from well known practitioners to assure us that the disease seems increasing in frequency. Here and there a place has recorded an unusual number, such as will require local investigation. There is some reason to believe that cancer must take its place as a degeneration of tissue, to which the body may become subject under a given set of circumstances, and that a change from the benign to the malign may take place. It is now claimed that a sudden development into virulency occurs, and that, as in

diphtheria, we are to determine the line between a follicular and diphtheritic sore throat, and the phenomena through which one may pass to the other, so we must study the determining or developing factors in some cases of cancer. Dr. Robert Newman, of New York city, in a recent article (Medical Record, December 24th, 1881, page 709), shows how a sarcoma may take on a cancerous development, and quotes from Rindfleish, Buechler, Billroth, etc. The deaths, as recorded for the last three years, are as follows: 1878–79, 378; 1879–80, 425; 1880–81, 451.

PUERPERAL FEVER.

The diseases of the puerperal state ought to receive close study, since they involve the loss of mothers. It is no longer doubted that many such losses occur through direct infection from nurses or physicians. Not a few practitioners now decline attendance immediately after a case of the disease, or of erysipelas of a marked malignant type. While due precautions may suffice, all need to recognize the peculiar susceptibility even to scarlet fever, which then seems to obtain. No pains should be spared in resorting to the most complete methods of disinfection, where there is the least possibility of conveying the contagion. The report of still births for the year is 1,476.

REMARKS.

We hope this year, by a plan authorized by the State Board, to invite physicians to the study of locality, and to the comparisons of disease, so as to enable them to apply the facts of statistics for purposes of closer inquiry, and, at the same time, furnish the advantage to be derived from fuller comparisons combined with personal observation. Every Local Board should, at least, preserve a record of the deaths and causes of death. This care of population and protection from such avoidable causes of disease as are necessarily prevented or abated by the aid of statutory provision, is so essential to the prosperity of the State, that the only questions which arise have reference to methods. These it is the duties of Boards of Health to consider with the greatest care, and to bring to bear thereupon all those vital facts which show the social conditions, the exposures and the diseases of the people.

While no provision is yet made in this State for that extent of

study, and of clinical tabulation, which is deemed expedient in some of the States, and in most foreign European countries, we are able to use the records with great advantage, and are collecting material which will hereafter admit of much more extended study.

The record for the current year certainly shows the great need we have to be more watchful over the causes of disease and the spread of epidemics.

The total record of deaths for the year 1880–81, is 20,964, being an increase of 1,997 over 1879–80, and of 524 over 1878–79. Because of a change in the law, it is probable that some deaths of 1879-80 did not find record. But there can be no question that the period from July 1st, 1880, to July 1st, 1881, must be registered as an unhealthy year. The extreme heat of two summers and the severities of two winters had their effect on various classes of disease. Malaria prostrated scores, whose deaths from chronic diseases were hastened by the complication. Typhoid fever, smallpox and typhus fever appeared as special, although localized, outbreaks. Besides those zymotic diseases, usually classified as preventible, number a great excess. Neither are the causes generally obscure. No vital statistician or careful physician can review our tables for the last three years without being able to see significant contrasts of degree, having to do with locality, with density of population, with neglects of drainage or sewerage, with non-removal of filth, or other ascertainable causes. It is as certain that you can cultivate disease into virulence by certain accumulations, as it is that you can secure an extra crop by the free use of appropriate fertilizers. So many households, so many villages, so many cities are doing this very thing. The people perish for the want of knowledge, or, still more, from failing to apply what is known. It is not all their own fault. There are duties which the State, the city, the township owe to the citizen that cannot be replaced by his personal efforts. The law and the help of an organized system must intervene. However large may be the supply of population from foreign lands, it is unfortunate for any old settled State when its birth-rate is not well ahead of its death-rate. It is unfortunate when, as is the case here, thousands are sick each year who suffer from avoidable diseases, and five thousand or more perish because they are not protected from evils, the relief from which is understood, but as to which they are powerless to relieve themselves. There has been great progress in sanitary knowledge and its applications, but most of our cities need better sanitary police as much as they need the preservation

of order in other respects. We urge upon every township and city Board of Health a more careful attention to the interests of their respective localities, and a careful study of this Report and the facts it presents, in order to make them earnest and efficient in securing better, stronger, longer life to the citizens of the State.

A STUDY OF CONSUMPTION AS A PREVENTIBLE DISEASE.

In the study of the diseases which deteriorate population, or cause numerous and premature deaths, none is more important than an examination into the causes of the prevalence of this disease. While it does not excite alarm as does the outbreak of some sudden and deadly epidemic, the death tables of almost every nation show that it causes a very large proportion of deaths. The English report of 1865 calls it "the most fatal of all human diseases." This, too, means an amount of prolonged sickness, and an entailment of race degeneration, such as belong to no other disease. From the standpoint of political economy, no less than in the special sphere of public health, it demands most careful attention.

At one time it was looked upon as a constitutional and inevitable disease, which in unchecked ravages would claim its yearly holocaust of victims. The advance of both medical and sanitary science has now shown how much it is the result of causes within our control, and how it behooves us to study its prevention in the interests of the people. It is the more important in a country like ours, to which there is a large emigration, since emigration usually represents a class particularly prone thereto. It is also important that in due time comparisons be instituted, such as will show us the proportions of the disease as represented by native and imported population.

The whole number of deaths from this disease reported in New Jersey for the last three years, is 8,488. This gives an average of over one-seventh out of the whole number of deaths from all causes.

The first cause of consumption which we note is that of inheritance, known as heridity. There can be no doubt, from the ample statistics both of this and other countries, and from the weighty testimony of physicians, that it is often derived from one or both parents, or even from an ancestry further removed.

Yet an analysis of such cases makes it very evident that the influence of this bias can often be checked or overcome. The children of

consumptive parents need in early life special attention, as to invigorating food, exercise, and the guarding against any irritation of the lungs. Cases are frequently within the knowledge of practitioners, where the members of a family which have led an in-door life, fall victims to the disease, while those who have an out-door life of not excessive exposure, overcome the taint, and so far eradicate it as not to entail it to their offspring. We know of a family of ten children, all but one of which died of consumption. The one who survived said that when a boy he perceived how all the older members of the family were affected, and resolved to live out of doors, and even chose sleeping in the open air in preference to a crowded bed-room. Simon says that in proportion as the people of a district are attracted to any collective in-door occupation, in such proportion, other things being equal, the district death-rate by lung diseases will be increased. For the bad ventilation which, as a rule, belongs to places of employment, tends to develop among the work people a large excess of phthisis.

Even those in good homes are not aware how often children are injured by being crowded in the same rooms, or sleeping so as to inhale each other's breath, and so have not the quality of pure air which is needed.

The hereditary tendencies of disease, and especially of this one, need full recognition, and then very much can be accomplished by preventive hygienic methods. It is all the more important, because these are the most hopeless cases, if there is a development of the disease.

SCHOOLS.

There can be no doubt that many of our school methods tend to foster or cause lung diseases. School rooms, even when large, need a constant supply of fresh air. The sitting position, long maintained, makes the lung itself inactive, or so constrained as to fail in a supply of air sufficient for healthy inspiration and expiration. The posture at desks is itself unfavorable to full breathing. Hence, there should be constant attention to the needs of the school room on the part of trustees and teachers. It is a great mistake to offer a free education to our American youth with such concomitants as insure feeble physical powers, and a limitation to healthful existence. The time has come when we know enough of the physical requirements for healthy air and healthy breathing, to warrant special attention thereto in the interests of the State, just because the child is a coming citizen, and

because his sickness or feebleness insure large present and prospective burdens. No child should remain as long as one hour in a sitting posture.

Much attention has recently been given to the effect of improper food in producing tubercular trouble. It is certain that children who are delicate often need more sugar and oil as articles of food than they can command. These, *taken at meal time,* with other food, have much to do with vitalizing the system. A poor quality of food, even when enough in quantity seems to be consumed, starves the system, and often leaves the person susceptible to colds, which, when occurring, are not easily overcome. It is now a serious question if there is not a more direct transfer of tuberculous disease. Facts are now being obtained and sifted which seem to indicate that the meat of tuberculous pigs or cows may communicate the disease. A form of tubercle, known as the pearl disease, is quite common with cattle, especially those that are closely kept in ill-aired stables. The disease is either identical or interchangeable with consumption. Whatever may be the question as to meat, it is highly probable that the milk of tuberculous cows engenders the disease in those freely fed upon it. There is much need of a careful study of milk diseases, since so many infants are dependent upon cows' milk as their food. Not only the marasmus and diarrhœa of children may be thus caused, but many cases of tuberculous disease in the lungs are believed to have this origin.

The relations of a proper dietary to consumption can only here be thus briefly alluded to. It is now well understood that different foods have as definite a relation to vital force, and to the prevention and resistance of disease, as have the fire and water of the steam engine to its propelling power. A study of foods and of food supply is needed in order to improve the health of the people, and to lead them to avail themselves of that which is most substantial and economic, as well as most healthy. (See *Report of Bureau of Statistics, 1880, p. 319.*)

The question of the contagiousness of consumption has been much argued of late years. Enough cases have come to record where a healthy wife has seemed to acquire the disease from a sick husband, or where those sleeping closely in wards with consumptive patients have become affected, to excite inquiry as to its modes of propogation. While it is not infective, in the usual sense of contagion, yet it is very certain that a continued foul and close atmosphere is made worse by

the presence of consumptives in it, and that liability is thus increased. Dr. Farr gives the opinion that "the prevalence of phthisis in the armies of Europe is probably due, in part, to the inhalation of expectorated tubercular matter dried, broken up into dust and floating in the air of close barracks." Similar contamination may take place in many a factory and sleeping room, and must be guarded against.

OPERATIVES' CONSUMPTION.

In the practice of medical men, it has long been recognized that lung diseases were often incited by dust in various forms, and especially that to which workmen are exposed.

In 1862 and 1863, the Local Government Board of Great Britain made an investigation into the subject, and secured a series of accurate facts, which may be relied upon as indicating some of the trades and employments especially hazardous in this regard.

The first statement has respect to potters in the great pottery centres of Stoke-upon-Trent and Wolstanton, of Staffordshire, including the principal earthenware and china manufactories of England. While only 30 per cent. of the men of these districts, over 20 years of age, were employed in the potteries, more than half, or 438 out of 827 deaths over this age in Stoke, and 241 out of 615, or nearly two-fifths of those of Wolstanton, were deaths of potters. This class of operatives, therefore, suffered a much larger mortality from these diseases, in proportion to numbers, than the rest of the population, and may, therefore, be presumed to have been exposed to some causes productive of pulmonary disease, from which the rest of the population were exempt. Dr. Greenhow was able, further, to show what branches of the trade were most deleterious. While chronic bronchitis was the most prevalent impairment, phthisis occurred in a large number of cases.

An examination into metal manufactories showed that pulmonary diseases were developed in proportion to the fineness of the dust and the constrained position and closeness of the work. Fish-hook makers and needle grinders suffered much. The introduction of a fan to blow away the dust had been found of great service. Those who worked at needle pointing were not able so fully to remove the impalpable dust, and so suffered more. While chronic bronchitis prevailed more than consumption, the latter was also produced. Dr. Greenhow, in this, and his second report, the year following, reviewed many of the leading industries of Great Britain, such as silk and lace making,

woolen factories, and workers in straw goods and in flax, button makers, watch makers, and many others, and showed how frequently lung diseases were produced, and consumption especially, as a result of the local bronchial irritation, or of unfavorable conditions as to food, air, etc. He thus states the conditions which have most frequently excited lung diseases:

I. The inhaling an atmosphere impregnated with dust, consisting of fine particles of metal or of sandstone, and of other materials used in various industries.

II. Inhaling an atmosphere containing carbonic acid or other gases unfit for respiration.

III. Working in ill-ventilated or over-heated factory rooms.

IV. Working continuously during many hours daily at a sedentary occupation.

V. Maintaining a stooping or otherwise constraining posture while at work.

In this State, pottery, glass-blowing, and various other industries need just this kind of analysis.

No one can read these valuable reports and other facts elicited since, without some appreciation of the interest which capital as well as labor has in guarding against the unnecessary complications to health, which are fostered by some industries, and most of which can be guarded against by adequate provisions of space, and by resort to simple appliances for protecting from dust.

The air which the artisan breathes should, as far as possible, be freed from all impurities. Clean streets, clean clothing, well ventilated shops, the moistening or blowing away of the dust caused in the work, and the consumption by fire of the gases and the smoke, are to be studied and applied, not only as a part of the rights and comforts of life, but as indispensable to personal vigor and race vitality. It is the right of the artisan summoned to work, as it is of the child summoned to school, that they should not find themselves compelled to breath air or inhale particles so injurious to health, as to be an unnecessary tax on vitality.

The influence of soil moisture and of defective drainage in causing consumption has been the subject of some important investigation. Conditions of climate have long been recognized as influencing pulmonary disease, and hence many changes are made in the apparent interests of invalids. Do we not overlook the fact that climate is in part an expression of soil and moisture conditions which have to do

with the ground about us? It has long been observed that low and damp places incline to this class of diseases—a fact not difficult of explanation when we remember that evaporation, heat and various atmospheric conditions are relative, and often can be modified by a change of soil, or by a removal of stagnant water, so that the air can freely permeate the ground to a sufficient depth.

We speak of the falling dew and a heavy fall of frost, forgetting that dew does not fall, but results from condensation of moisture arising from the relative relations of the heat and moisture of the atmosphere, and of the ground itself. The fact that the grass plot has dew and the gravel walk not, is to be thought of when we speak of different climates, since the thought suggested applies to sandy and gravelly soils, and to a modified degree to all the varieties of geological structure. Besides, the presence of mountains and of forests, and the relations of exposures to sun and light, have their influence.

There has long been some general recognition of the relation of dampness of soil or ground to disease, and especially to pulmonary disease, but the point was not dwelt upon and illustrated until Dr. Bowditch, in this country, and Dr. Buchanan, in England, conducted a series of definite inquiries. The observation of Dr. Bowditch had led him, in 1855 and 1856, to make some suggestions as to the law of soil moisture as related to consumption. The fact that the disease was not equally distributed in localities having the same kind and density of population soon became apparent. Dr. Bowditch made a very critical examination of the reasons of this difference, and examined and collected a large number of statistics bearing upon the subject. The study led him to present two propositions:

I. A residence on or near a damp soil, whether that dampness be inherent in the soil itself, or caused by percolation from adjacent ponds, rivers, meadows and marshes, or springy soils, is one of the primal causes of consumption in Massachusetts, probably in New England, and possibly in other portions of the globe.

II. Consumption may be checked in its career, and possibly—nay, probably—prevented, in some instances, by attention to this law.

Facts in evidence were adduced to show the humidity of soils on or near which stood towns, villages or single houses where consumption had most prevailed, and that moisture of the soil is the only known characteristic uniformly connected with "the consumptive-breeding districts."

Dr. Buchanan, in England, did not start his investigation in refer-

ence to phthisis, but in order to find out what had been the effect of structural improvements in twenty-five towns for a series of years. Dr. Simon, in examining the facts elicited, says: "The columns appear to indicate a partial dependence of pulmonary phthisis on some of the unwholesome conditions which have been removed. And when detailed examination is made of the cases which give that indication, and they are compared with the different classes where phthisis has not lessened its amount, *the novel and most important conclusion suggests itself, that the drying of soil, which has in most cases accompanied the laying of main sewers in the improved towns, has led to the diminution, more or less considerable, of phthisis.*" (*Report of 1866, p. 16.*) Dr. Buchanan says "that in some of the twenty-five towns a third or a half of the whole mortality from this cause had been removed, while in other towns it had been stationary or decreased. *The sanitary improvement that coincides with decrease of phthisis is, town after town, with least frequent exception, the drying of the ground on which the town stands.*" The next year (*Report of 1867*), Dr. Buchanan made a most valuable report, and arrived at the full conclusion "*that wetness of soil is a cause of phthisis to the population living upon it.*" We think it may now be claimed as an accepted fact that stagnant water and soil dampness cause lung diseases, and that the fatality of these, and especially of consumption, has a marked relation thereto. Coughs and colds do not all come from the sky. There are afflictions from the ground. This relation emphasizes anew the importance of drainage as promotive of the public health. It is one of those cases in which the interests of agriculture unite with those of health.

The relation of damp houses to all lung diseases, and especially to consumption, can not be too much emphasized. In these days, when the laws of healthy construction are so well understood, the damp basement, with its exclusion of light, and walls unfavorable to air ventilation, and all constructions which do not take dampness into consideration, are to be closely criticised. Now that water is so much introduced into houses, there is additional need of caution lest soil already damp or imperfectly drained have added to it a new source of stagnant water.

The study of the relation of climate to consumption, and to all lung diseases, is another matter worthy of our careful attention. It has long attracted the notice of medical observers, and no disease has so often been benefited by change of climate. It is equally true that

particular climates need to be studied with reference to the character of cases and their stages of progress. Else change means acceleration of the disease. It is evident, too, that families showing pulmonary proclivities to disease can be benefited by change of residence, and thus the act of prevention be applied not only to persons affected, but to the entire lineage. To our citizens and for our civic progress it is all the more important, because of our great variety and adaptability of climate. With perfected geologic, meteorological and vital statistic records, we believe that medical men will, as students and observers, make the subject a specialty, will yet be able within our own State to locate those seeking the best climates for forms of lung disability. The freedom from cold and malaria to be found in our most southern counties, and some advantages that can be claimed for some nooks among our hills, point to New Jersey as a suitable home for many who are not benefited by the climate of the extreme south.

The accompanying tables were not finished until after these pages were written, and so all the more forcibly serve to illustrate what has been said. No one can compare the various counties or the cities with them, or with each other, without perceiving the line of evidence. In cities where there is no drainage or sewerage, the record is sadly suggestive. Such cities have no need to wait for typhoid fever or diphtheria to suggest the existence of sewer gas. Ground dampness and soil saturation tell upon vigor and life, and especially upon the lungs, in many ways. Asthma, pneumonia and chronic bronchitis often need to be added to the list. Although the inhabitants of Cape May are not sufficient in numbers for full conclusion, no one can follow up diseases and ages in that county, as has been our duty, without observing some of its advantages for health—advantages shared by adjacent counties, also, in special localities. The climatology and weather records also confirm the idea of mildness and evenness of temperature and moisture.

We offer the suggestions contained in this paper only as preliminary, and for the purpose of directing attention to the study of consumption as the great waster of human strength, the greatest tax on population, and the most potent consumer of national vitality. To limit its ravages is one of the attainments within the reach of our Boards of Health, of our physicians, and of those who are aided by the State in that division of political economy which is known as public hygiene. To such we commend, as preliminary, a study of these tables.

The death-rate from consumption, for three years, is based on the census of 1880, and so is smaller than the actual fact, to the degree that the number of population for the two former years was less. For all counties or cities representing less than 50,000 people, or an average population for each year of 17,000, the rating is to be taken with some allowance since the numbers are not sufficiently large to eliminate common errors. Even for those larger the series of years is not sufficient for complete conclusion. But the table and the study therewith of localities or townships, and of counties and cities, as compared with each other or among themselves, shows great diversity, such as is dependent on locality, occupation, social condition, climate, drainage and sewerage, and other causes within the sphere of closer analysis as numbers and observations accumulate.

RETURN OF DEATHS FROM CONSUMPTION

In the Counties of New Jersey, for 3 Years, viz., from July 1, 1878, to July 1, 1881.

COUNTIES.	1878–79.	1879–80.	1880–81.	Total.	Population, census of 1880.	Death rate per 1,000 from consumption.
Atlantic	36	48	41	125	18,704	6.68
Bergen	87	94	80	261	36,786	7.09
Burlington	155	150	116	421	55,403	7.59
Camden	187	168	180	535	62,942	8.48
Cape May	12	12	9	33	9,765	3 37
Cumberland	92	108	91	291	37,687	7.72
Essex	554	511	585	1,650	189,929	8.69
Gloucester	67	45	61	173	25,866	6.68
Hudson	414	516	587	1,517	187,944	8 08
Hunterdon	59	67	71	197	38,570	5.10
Mercer	178	174	171	523	58,061	9.00
Middlesex	110	102	125	337	52,286	6.44
Monmouth	132	128	109	369	55,538	6.64
Morris	111	87	107	305	50,861	5.91
Ocean	32	28	34	94	14,455	6.50
Passaic	186	180	235	601	68,860	8.72
Salem	73	49	49	171	24,579	6.95
Somerset	55	41	70	166	27,162	6.11
Sussex	54	38	44	136	23,539	5.77
Union	117	115	151	383	55,571	6.89
Warren	77	50	73	200	36,589	5.46

Total consumption death-rate for the State, 6.85.

RETURN OF DEATHS FROM CONSUMPTION

In all Cities of Over 5,000 Inhabitants in the State of New Jersey, for 3 Years, viz., from July 1, 1878, to July 1, 1881.

CITIES OF OVER 5,000.	1878–79.	1879–80.	1880–81.	Total.	Population, census of 1880.	Death rate per 1,000.
Atlantic county—						
Atlantic City	10	11	13	34	5,477	6.20
Burlington county—						
Bordentown	17	24	13	54	5,334	10.12
Burlington	28	28	25	81	7,237	11.17
Camden county—						
Camden	120	115	125	360	41,659	8.64
Gloucester City	19	17	17	53	5,347	9.91
Cumberland county—						
Bridgeton	21	28	21	70	8,722	8.02
Millville	14	36	23	73	7,660	9.53
Essex county—						
East Orange	13	15	22	50	8,349	5.98
Newark	448	396	453	1,297	136,508	9.50
Orange	33	47	33	113	13,207	8.55
Hudson county—						
Bayonne	13	22	17	52	9,372	5.54
Harrison	12	20	19	51	6,898	7.39
Hoboken	76	76	93	245	30,999	7.90
Jersey City	327	344	390	1,061	120,722	8.78
Town of Union	14	12	21	47	5,849	8.03
West Hoboken	7	7	10	24	5,441	4.41
Mercer county—						
Chambersburg	16	17	17	50	5,437	9.19
Trenton	108	108	101	317	29,910	10.59
Middlesex county—						
New Brunswick	47	36	43	126	17,166	7.34
Morris county—						
Morristown	18	19	16	53	6,837	7.75
Passaic county—						
Passaic City	10	14	21	45	6,532	6.88
Paterson	156	152	197	505	51,031	9.89
Salem county—						
Salem	20	8	14	42	5,056	8.30
Union county—						
Elizabeth	51	49	95	195	28,229	6.90
Plainfield	17	19	24	60	8,125	7.38
Rahway	32	26	11	69	6,455	10.68
Warren county—						
Phillipsburg	13	11	15	39	7,181	5.43

NOTE.—The death-rate of some watering places is raised by the deaths of non-residents.

A REVIEW OF ENGLISH STATISTICAL REPORTS,

AS A GUIDE TO THE STUDY OF VITAL STATISTICS.

In the study of every subject there is need of a close study of models. The advantage of this is, that it acquaints us with the plans of those who have won positions as experts, with improvements made, with criticisms offered, and thus presents an outline of the science and the art which are attempted. While there must not be servile adhesion to authorities, no man is fitted to test his own originality or facility of work until he has acquainted himself with the methods devised and successfully operated by others. As it is one of our objects, also, to help forward those who, in the interests of population, desire to study vital facts, it is well, in a succinct and orderly way, to present outlines. We apply this idea by a brief review of the forty Annual Reports of the Registrar-General of England, with all the more zeal because the entire reports are rarely accessible in this country, and because they are of authority as models beyond any others. These forty reports relate to a period which has been largely formative, and yet which has aided much to give statistical methods a definiteness and a certainty such as obtains in a true science and in a distinct, although incomplete art. They show the gradual but certain advance which has been made. They reach over a period which has given opportunity to verify or dispute principles enunciated. They have so been conducted by Registrar-General George Graham, and by the medical superintendent and statistician, Dr. Wm. Farr, as to present their bearing on political economy and State health care. The length of service of both of these gentlemen has given unity and thoroughness to the system adopted. They have kept well apace with the advances made.

The first Annual Report of the Registrar-General of England was made to Lord John Russell, Secretary of State for the Home Department, in 1839, by the then Registrar-General, T. H. Lister, and

related to the year extending from July 1st, 1837, to June 30th, 1838. Before this there had been parish and other extended registrations, which had proved of much value. A commission had been appointed, in 1836, for the purpose of inquiry into the state, custody and authenticity of registers or records of vital returns in England and Wales. A copy of this report is in the library of the State Board of Health. The result of the report, and of other movements in the interests of population, was to secure a recognition of the whole care of registry, and the study of vital returns, as a distinct department of service.

The earliest and most special attention, so far as health studies were concerned, was given to the record of causes of death. Says the first report: "Tables exhibiting the proportions of deaths at every successive year of age, are among the most important materials, from which are deduced the true principles of life annuities and of life insurance, and the rules of friendly societies established for the use of the poorer classes." The commission's report recommended "an accurate and extensive collection of facts whereby may be facilitated the solution of all questions depending upon the duration of human life." In order to make these results "the source of important benefits, especially to the poorer classes, the registrar-general sought to secure facts as to the relative conditions, in town and county, and among different classes of people and of labor." One of the first comparisons, that of the mining parts of Staffordshire, Shropshire, Leeds and its suburbs, Cambridgeshire, Huntingdonshire, and the lowland parts of Lincolnshire, with several of the northern counties of England, showed a contrast of death-rate of infants under one year of 270 out of 1,000 deaths at all ages, and in the latter 180 out of the same number.

The first report as to marriages and births, gave merely a summary of the number of marriages, and the number of males and females not of full age, with the totals of births and the number of each sex. The death tables gave the area in acres of various divisions, the population by the census of 1831, the number of families, and the number respectively employed in agriculture, in trades, and manufactures and handicraft, and other families. It gave the number of males and females dying below the yearly ages, up to thirty-six or thirty-seven years of age, and tables showing the proportion of 1,000 registered deaths, which had occurred at various ages, up to ninety and upwards, in the whole of England and Wales, and in each of twenty-five divisions, which were made for comparisons. In some cases cities, and in some cases counties or districts, are in the comparison. The divisions

were under one year, and from one to three, from three to five, and after that by fives up to ninety.

The work was greatly aided by the sanction given to it by the Royal College of Physicians, the Royal College of Surgeons, and the Masters of the Society of Apothecaries, as represented respectively by their chief officers, Henry Halford, Sir Astley Cooper and J. Hingeston. J. Finlaison, the Actuary of the National Debt Office, aided in the work of what he called "political arithmetic," since he saw the important service of such statistics, and pointed out how, even with the imperfections of return which would occur, yet under a continuous system, the calculators would be able to make it "infallibly known how many deaths and births escaped registration, no less than the material fact of how many persons of each age and sex do now co-exist."

In this report, under date of May 6th, 1839, appears the first letter of Mr. Farr, as the Medical Superintendent of these statistics. Although so brief, it shows that he had comprehension of that work, from which he has just now retired, and which has made him one of the most distinguished contributors to statistical, medical and political science, all of which are economies applicable to the arts of home and civic and national life. He recounts the value of such returns in various aspects, but insists that the most important is in showing "the influence of civilization, occupation, locality, seasons, and other physical agencies, either in generating diseases and inducing death, or in improving the public health." He points out the value of a knowledge of the "epidemic constitutions" of years and places, as well as of the names of disease; of the precision and numerical analysis it would give to the principles of physic, by substituting measure for guess, and claimed that it would add to industry and wealth, because preservation of life would mean increase of vigor, and because "diseases, which are the iron index of misery, would recede before strength, health and happiness, as the mortality declined."

Comparisons instituted between city and county brought out already in bold relief the intensity of the extremes. While the average of England and Wales, as to population, was 265 to the square mile, the heart of English cities showed 263,000 inhabitants to the square mile. In the latter, the ratio of deaths to the population, were "from fifty to sixty per cent. more numerous than the deaths in the countries." It thus soon becomes evident that locality

and density of population have much to do with disease and death. It is easy to see that it is a vital necessity for a nation to know the causes of such wholesale deterioration. How it is brought about is thus graphically written: "Place 200,000 individuals upon a square mile; intersect the space in every direction by 10,000 high walls, which overhang the narrow streets, shut out the sunlight and intercept the movements of the atmosphere; let the rejected vegetables, the offal of slaughtered animals, the filth produced in every way, decay in the houses and courts or stagnate in the wet streets; bury the dead in the midst of the living; and the atmosphere will be an active poison, which will destroy, as it did in London formerly, and as it does in Constantinople now, 5.7 per cent. of the inhabitants annually, and generate, when the temperature is high, recurring plagues, in which a fourth part of the population will perish."

The second report extended the details as to marriages and births, so as to give the number occurring in each quarter of the year, and made comparisons of the births and deaths for districts.

A comparative statement was also made of the ages of persons in the several counties, showing what would be the number of persons of the several specified ages in the several counties, both of males and females—the whole number of each being assumed to be 10,000. Thus the percentage of the various groups of ages could be shown. The contrasts between county and city death-rates were still more fully verified and magnified; yet not in a spirit of abandonment. It was noted that even in the metropolis the "mean duration of life was from twenty-five to thirty years in the east districts, and from forty to fifty years in the north and west districts." It was shown that health and life are preservable, provided the density is not carried beyond certain limits, and if cities avail themselves of advantages within their reach. It was proposed, in the densest neighborhoods, to open some wide streets, through which the collateral streets would be ventilated by fresh atmospheric currents. An epidemic of smallpox, in which over 11,000 died, led to a discussion of the causes which give the maximum activity to such diseases as are always present in a metropolis.

The excess must be accounted for by assuming that the disease had its origin in some spreading physical cause; that the contagious principle grew more virulent, and was conducted with greater facility by the atmosphere; that the susceptibility of the population increased, or,

finally, that the tendency of the organization to fall into this peculiar pathological state augmented spontaneously."

In the third report the forms of tables and comparisons remain undisturbed. The letter of Mr. Farr discusses, especially, suicide, and the principles which are the basis of the law of investigation in coroners' inquests—a subject still needing our careful inquiry.

The classes of disease were given in twelve divisions, as follows:

1. Epidemic, Endemic and Contagious, including Smallpox and Typhus.
2. Diseases of the Nervous System.
3. Diseases of the Respiratory Organs, including Phthisis.
4. Organs of Circulation.
5. Digestive Organs.
6. Urinary Organs.
7. Organs of Generation.
8. Organs of Locomotion.
9. Organs of the Integumentary System.
10. Of Uncertain Seat.
11. Old Age.
12. Deaths by Violence.

A separate table of the London hospitals was made for comparison.

The fourth report, that of 1842, was by the hands of George Graham, who from that time continued to be Registrar-General until 1880. The kingdom was now divided into 619 districts and 2,184 sub-districts to secure accuracy of return, and the tables were extended so as "to apply to the tables of the population, the marriages, births, deaths and ages at death." The comparisons of marriages and births were made with the females living, and it was claimed that the number of these was the best basis for nearly all of the comparisons, since more of the male population is floating or absent at the time of any enumeration by census. The fact was noted, that in the area of city and country some cities include more of a half-rural district than others, and that therefore the ratio of dense and scattered population must be known. In his letter accompanying his report, Mr. Farr, on the basis of the statistics, discusses the laws by which the increase of the population is regulated. In the study of marriages he takes only first marriages, because "the first marriages represent the number of persons who marry annually," if those of both sex are enumerated. From various facts he is able to adduce, he shows that the fears of Dr. Price, in respect to depopulation, and those of Mr. Malthus, as to increase beyond the means of subsistence, are alike

groundless. *Families, and not individuals, are the basis of State power and thrift.*

In order that death returns might be more informatory, Mr. Farr revised the statistical nosology, and gave to it the outline which it has since, for the most part, maintained. It is of interest, however, to recognize some of the changes which more accurate knowledge has rendered necessary.

We are told that pestis, or plague, which in the London bill of mortality, A. D. 1665, numbered 68,956, had 2 cases only reported in 1679, and that it then merged in "spotted fever" or "ague and fever," and has now disappeared. There are remarks as to scrofula, phthisis, pneumonia, etc., well worthy of passing note.

Prout is quoted as saying that rheumatic fever is apparently caused by a miasma, and that malaria excites it. The term "zymotic" is introduced as a substitute for "epidemic, endemic and contagious diseases."

Quotations from Sydenham quite accord with more recent views of evolution, while putrefaction and specific genera of infusoria and minute vegetables of the lowest class had before been commented on as the cause of epidemics. (*Vol. 1, p. 95.*)

The fifth report contains notices of life tables of much importance in their bearings on life assurance and annuities. It is noted that, notwithstanding the risks of maternity, the chances of life from twenty-five to forty-five are greater among women than men, on account of the greater risks of the latter to accidents of various kinds.

Too much importance has been attached to obtaining the mean age at death, i. e., "to the summing up of the ages at which people die, and dividing the number of years by the number of deaths." Because, for instance, "professions fluctuate more than the general population," certain professions, stations and ranks are only attained by persons advanced in years, and some occupations are only followed in youth. So the mean age at death, or the age at which the quoted number of deaths occur, cannot be depended upon as showing fully the influence of occupation or longevity. In order to show the contrast between city and country, we have, by a diagram, a graphic delineation of the difference in the lives of 100,000 living in Surrey, Liverpool and London. Of the 100,000 born in Surrey, more than half are alive at the age of fifty, while out of the same number born, 41,000 live to the age of fifty in London, and 26,000 in Liverpool. Among the facts seemingly elicited in this report was the inefficiency of the

lancet in arresting pneumonia, the magnified danger of what is called the "turn of life," and the necessity of distinguishing between rheumatic fever, or acute rheumatism, and those chronic aches called by this name. Important facts were also elicited as to the large losses of women in childbed, and the contagious fever which sometimes occurred as an epidemic. The causes of high mortality in fever districts were considered, and the chief excess attributed to the excessive presence of decaying organic matter in the atmosphere. The bearing of health, on the value of wages, and the comfort of the working classes is clearly shown. The sixth report gives some attention to the births of illegitimate children, as showing the condition of the population, and their especial limitations of life.

The number and causes of death, and of males and females, are, as before, separately considered.

A study is made of the number of violent deaths in various occupations, and a general comparison given of all the vital statistics of various nationalities outside of the kingdom.

Dr. Farr objects to too much reliance on the "mean age" at death, which was the first basis of "Tables of Mortality" or "Life Tables," and to the second, but better method, in which *the mean population is divided by the annual deaths, or the proportion dying in a year, to 100 living, of all ages is found;* and the relative *mortality of two districts or counties is thus compared.* But, on account of errors which occur from emigration or immigration, he gives preference to the method of Dr. Price in the Swedish table, and Mr. Milne in the Carlisle table. He expresses it thus: "By taking the population living in the middle of a year (1841 for instance) at each age, 1–0, 2–1, 3–2, 4–3, 5–4, 10–5, etc., and the deaths in the same year at the same ages, we find how many die in each year of age, out of a given number living, and can calculate, therefore, how many will arrive at the age of 1, 2, 3, 4, 5, 20, 30, etc., years, or determine the true mean duration of life." The bearing of this knowledge on national progress, and on the life insurance industry, is easily perceived.

The seventh report claims that the age of the mother at marriage, and at the birth of her children, must always be given. The value of the registration of vital statistics is shown as "*deterring from crime, fostering a reverence for human life, and discovering the causes of premature death in the various circumstances of the population.*"

In the eighth report the Registrar-General notes how "the fluctuation in the marriages of a county expresses the views which the

great body of the people take of their prospects in the world," and illustrates it by a series of historical and numerical facts. Dr. Farr shows how the registration act throws light on the causes that affect the health of the people, and how, incidentally, it is of great value to the interests of life insurance. In this and the ninth report, meteorology takes its place for more distinct notice. The effect of various agencies on health is discussed, and while a cyclical law is admitted, the terror of epidemics is shown to arise from local conditions.

"Internal sanitary arrangements, and not quarantine or sanitary lines, are the safeguard of nations," is the language of the tenth report. Yet the fact is noted that cholera is epidemic first in India, and influenza in Russia, and that the points of origin must be attended to. The latter was a very fatal disease in England the previous year.

The meterology of England, which had first been separately commented upon by James Glaisher, Esq., F. R. S., of the Royal Observatory, Greenwich, in the report of 1846, from this time onward to the present has received his careful comparison.

The eleventh annual report, containing abstracts for 1848, notices the decline of typhus fever in London, which the year before had marked a mortality of 3,184. The examination of sewerage in London showed 191 streets or ways wholly without proper sewerage, and a great portion of the remainder defective or incomplete.

The twelfth report contains a new English life table, calculated by Mr. Farr, as well as some valuable comments on the whole system of insurance. The study of life, of disease, of death, has very important relations to insurance, and proper systems of insurance, founded on vital studies, have very important relations to a provident care of that large portion of population that can expect no other way of meeting some of the contingencies of human life.

The bearings of the system as a matter of political economy and state thrift, need to be carefully studied. It takes the place of friendly societies, upon which English artisans have so much depended, and is capable of results as progressive as if it were a trade or an art. The comments upon the revelations which epidemics make of polluted rivers, crowded workhouses, stagnant sewers and cesspools, undrained and uncleansed cities, and of their propagation and extension from such lurking-places, are still applicable. Statistics are carefully compared as showing the "insalubrity of undrained land." Thus, the mortality of Ely, North Witchford, Whittlesey and Wis-

beach, in Cambridgeshire, at the mouth of the Nene, was 2.45 per cent., while that of the high parts of Surrey, Sussex, North Devon and Northumberland was from 1.80 to 1.40 per cent.

The frequent change of camp was shown to be a necessity in war, because of the befoulment of land by human effluvia. "But an undrained town, insufficiently supplied with water, drains and sewers, has the inconvenience of a perpetual camp," with its fevers and fluxes, besides a surety of being exposed to fatal epidemics.

In the appendix of the report of 1849, commences a new series of quarterly returns, giving not only deaths, but the marriages and births in all the over 2,000 sub-districts. More attention is also given to facts in climatology. It marked a change or extension of method which aggregated facts, so as to show them in closer relations and with more specific areas. These statistics, says the report, express the results of the circumstances and infinite variety of conditions in which the seventeen millions of inhabitants of England are placed.

As they are facts, and are expressed numerically, they admit of no exaggeration; while they correct the fallacy of judging of the state of a great and various kingdom, either from the field of one man's experience—from his own parish or county—or from vague, accidental, prejudicial representations.

The letter of Dr. Farr to the Registrar-General, is with reference to life tables as deducible from bills of mortality. It is a most valuable presentation of the bases of calculations as to life insurance as well as to provisions for sickness or for remuneration in case thereof. He claims that "the rate of mortality in decennial periods after the age of fifteen, furnishes the most satisfactory basis for determining the series of fractions to express the probabilities of life."

In the thirteenth report, in comments as to smallpox and the neglect of vaccination, reference is made to the recent investigations of Mr. Cerly, of Aylesbury, who "introduced the matter of smallpox, taken from man, into the cow and produced pustules, which supplied lymph and raised pustules in children, possessing the properties of cowpox, and which have served since for all the purposes of vaccination, thus proving that cowpox is a modified smallpox," a point now often disputed. The report, in reference to the contrast afforded as to the aggregate mortality in the open country as compared with cities and towns, says: "The juxtaposition of the figures in the table suggest the melancholy reflection that more than seven millions of people inhabiting the metropolis and all the cities and great centers of indus-

try are still exposed to a mortality which is not inherent in their nature, but is due to the artificial circumstances in which they are placed. The waters, the sewers, the soils, the church-yards, emit poisons. To every 10 natural deaths, 4 *violent* deaths, *i. e.*, deaths from these poisonous exhalations, are superadded. The quarterly summaries are accompanied with quarterly meteorological statements by James Glaisher, F. R. S.

The tables of summary as to the seventeen groups of causes of death, are made more informatory by Table I.—Giving the causes of death registered in England for four successive years; Table II.—The *causes of death* to one million persons living in 1850, the deaths from each class of causes, and from each cause; and Table III.—*Causes of death* to one million deaths from all specified causes, in the year 1850, the *proportional numbers* for each class of causes, and from each cause.

In the fourteenth report, the Registrar-General again notices that the *mean* age at death is not to be relied on to show the healthiness or insalubrity of certain occupations, "which depends on many circumstances besides health, and among others upon the ages of the living, which varies accordingly or not, as the business is one entered into early or continued into late in life." The tables as to the influence of occupations, contained in this report, are valuable. The best average is represented by farmers, and the heaviest rates of mortality by miners, laborers, butchers and inn and beer-shop keepers. Tables II. and III. of the previous report are consolidated into one. The fifteenth report, for 1852, notices consumption as "the greatest, the most constant and the most dreadful of the diseases that afflict mankind." It causes nearly half the deaths between 15 and 35, and during one year was fatal in 50,594 cases. Of the constitutional diseases after consumption, dropsy is the most fatal. It caused, for the same period, 9,788 deaths, and stands, for diseases of the heart and kidneys, most frequently. Rheumatic fevers are placed in the zymotic class. Violent deaths, or deaths by external causes, were 3.6 to every 100 deaths, or 14,475.

The sixteenth report (1853) refers to the deductions made in the thirteenth report by comparing the number of people living in 1841 and in 1851, with the number of births and deaths in each of the ten years. The deaths to 1,000 vary to some extent, as the population is composed more or less of children or adults, but the birth-rate and the death-rates at certain specified ages, help to eliminate any error from this cause. The series of results are deduced by dividing the

deaths in the ten years, 1841–50, by ten times the authenticated mean of the population enumerated within the 628 districts in 1841–1851. It is shown that the general results thus obtained are reliable. In Rothbury and Glendal, in Northumberland, and Eastbourne, in Sussex, the annual death-rate was only 15 deaths in 1,000 living. In a summary of all the districts, the Registrar concludes that the mortality from natural causes, through the kingdom, does not exceed 17 per 1,000, and that all deaths above that number are to be referred to artificial causes. An analysis shows that the excess results from unhealthy occupations, the want of natural care, resulting from the necessary toil of mothers, marshy lands, and the "condensation of people in towns, without the requisite mechanical and chemical arrangements for removing concentrated impurities, for supplying pure water, and for introducing through large streets free currents of pure air."

The good results of vaccination and the evils of neglect are illustrated. The prevalence of carbuncles and boils, as an epidemic, in two districts, is noted. Prof. Laycock (nineteenth report) claims carbuncles as sometimes contagious. The evils of water contaminated by sewage had been fully illustrated in severe sickness at Newcastle-upon-Tyne, at Hull and at Exeter, and the labors of Dr. Snow had served to awaken attention to its effect on cholera and other epidemics. The report of Mr. Farr on Nomenclature and Statistical Classification of Diseases, for statistical returns, as initiated by the first Statistical Congress, at Brussels, is one of great value, and has aided much in that grouping of diseases and causes of death which is indispensable to the deductions of great principles as to the laws of preservation of human life. The report of the second Statistical Congress, held at Paris (1855), the first having been held at Brussels in 1853, shows the importance attached to statistical nosology, statistics of insanity, of epidemics, of accidents, and of the whole area of vital statistics.

The seventeenth report notices the fact that the health of operatives is so much affected by dust as that it has been proposed to distinguish a class of pulmonary diseases as "sand and dust" consumption.

With all the talk about the risks of maternity, it is claimed that in a good state of society the child-bearing women of a population are "select lives" in the insurance sense. The circumstances under which a common disease, as diarrhœa, takes on an epidemic form as cholera, are worthy of much study.

Local and meteorological circumstances had much to do with the

virulence of the disease at Newcastle-upon-Tyne, in 1853–4. "Zymotic matter is evidently distributed at different degrees of strength, and there is a point of strength at which it strikes down all resistance and overwhelms a population with destruction. *The causes of this destructive form of the disease* fluctuate much more than the causes of the diarrhœa.

The mortality of cholera was highest on the land, at the low mouths of rivers, and generally on the low ground of towns. "Cholerine or any other organic matters, mechanically suspended, either in the air or in the waters, necessarily accumulate in the lower strata."

The language of the eighteenth report has not ceased to be applicable in this State.

"The great work of the day is to improve the health of the people; and the first steps toward its accomplishment are the throwing open building grounds on favorable sites, facilitating the distribution of the population over town and country by railways, supplying the towns with pure water, draining and opening streets, and removing constantly for immediate deposit in the soil, the town guano, which would, no doubt, prove an excellent substitute for that imported."

In the nineteenth annual report (that for 1856), the value of a coroner system is shown to be not only in detecting criminality but also in protecting from carelessness, nuisances, etc. The utility of inquest is not to be shown by the number of crimes found to be committed but by the number which the system prevents.

The record of death certificates is a mild form of inquest, and much helps to prevent crime.

The report of the Third Statistical Congress, held this year at Vienna, adds valuable information.

"Without the possibility of comparing observations, progress in the sciences, based on observation, is impossible." (Quintelet.) This is why statistics as to life and death are so important. The review of marriages in the twentieth report again notices that these vary with the prosperity of a country.

"The marriages of the middle-higher classes are apparently most numerous when the price of wheat is highest, while the reverse happens with respect to the marriages of artisans and laborers. These marry in the greatest number when the price of wheat is near the general average. All violent fluctuations in prices are injurious, and the medium price, whatever it may be, is most favorable to the happiness of the great bulk of the people."

It is shown that in certain marshy districts the mortality is raised

from 17 to 24 for 1,000, chiefly in consequence of the noxious emanations from a rich, ill-drained soil. Fever and ague are the most ready indices. The comparison between several healthy and unhealthy districts still more proclaims how many deaths are artificial and avoidable. Since ours is so much a city State, the comparisons between town and county are most important. The report for this year (20th) notices an unusually stagnant condition of the air in August and the high temperature, as causing great increase of diarrhœa and of diphtheritic disease. In comments upon the puerperal diseases, Dr. Farr notes that a society had recently been formed "for the cultivation of the important act" of care for the conditions of maternity.

"The excretions of the skin, frequently absorbed, give rise to some forms of zymotic disease." Ablution is the preventive. It is conceived that epidemics in clouds of invisible mist exist at times in the atmosphere, and their settling and their violence may depend on climatology and telluric and personal conditions.

A remark in the twenty-first report, on education, suggests to us the care of public health is all the more important, because of the interferences which sickness causes to education. The securement of education and of health are the most important interests to a republic.

The report of 1858 has the first extended notice of diphtheria. "Public men will yet find," says the report, "that some glory may be gained by saving life by great sanitary works. It was in 1858 that the Legislature gave the inhabitants of every district of England and Wales the power to raise the money and to execute the great works which the country requires." These were known as the public health and local government acts.

It marks the era with which commenced "The Report of the Medical Officer (John Simon) of the Privy Council," a series of reports which have done more for public health and State life-care than all others. The report narrates additional facts as to malaria. Bedlington is quoted as showing with what precision the death-rate can be advanced, it being 23 in 1,000, in 1856; 27 in 1857, and 35 in 1858. The description of its evils ends by saying, "Bedlington neglects sanitary measures and sits tranquilly over its cesspools, which send up disease among the inhabitants."

In the twenty-second report (1859) the valuable results to health which had been shown in the districts of the Nene, are referred to. It is insisted that great manufactories should consume their smoke, instead of leaving it to be consumed by the people.

It is said: "The improvement of the health of London has proceeded step by step with the amendment of the dietary, the drainage of the soil on which the houses stand, the purification of the water which the people drink; with the sweetening of the air and with the progress of medical science, which is the source of sanitary doctrines. The causes of disease are numerous, but every one that has hitherto been discovered can be to a certain extent controlled. In its zymotic diseases the solidarity of the human race is unquestionable."

In the report of 1860, among the incidental advantages noticed of birth registry, is the fact that not so many children are left to die without medical attendance. Rheumatism as well as ague is largely attributed to the undrained land. In order to compare results of registry for ten years, there was made an extended supplement to this report, in which special tables of comparison were published. Tables were also given more fully of the effect of occupations, although, owing to the uncertainty in the naming of the trades, the influence of trade and profession upon mortality and duration of life must not be too hastily calculated.

The report of 1861 gives some valuable comments on the misfortune of cesspools, and the diseases resulting therefrom.

The twenty-fifth report draws attention to the fact that the high death-rate of Liverpool, Manchester, etc., are the fruit of causes long in operation and made worse by increasing density of population, since this is the "worst-drained part of England." Typhoid fever is so much a pythogenic or putridity fever that Dr. Murchison gave it this name, and believes that it is "often generated spontaneously by fecal fermentation." For the first time, ovariotomy is alluded to, with the fact that Mr. Spencer Wells had operated on one hundred cases and sixty-six had recovered.

In the twenty-sixth report, attention is drawn to the fact that scarlet fever, which had been very prevalent and fatal in parts of the kingdom, admits of preventive measures. It seems to have reached us from Arabia, and demands the most careful study as to its laws of propagation, and the means of its dilution and limitation.

It occasioned 30,475 deaths that year, and diphtheria, which first figured in the returns of 1859, caused 6,507 deaths.

In the twenty-seventh report it is noted that the registration of deaths had often served to bring crime to light, as in the case of Palmer, Pritchard and others.

The twenty-eight report (1865) gave a careful notice of vaccination,

which had first become a subject of legislative act in 1802. The country was, in 1865, threatened not only with cholera, but yellow fever. The Hecla, from Cuba, laden with copper ore, entered Swansea harbor, and landed James Saunders, who died that day. Twenty-nine persons, who had been in or near the Hecla, were attacked, and fifteen in all died of it. "The disease did not spread by contagion, but was apparently induced by the diffusion of the fever miasm among the people." The last death occurred October 8th.

The report of Mr. Leigh, of Manchester, notes the fact that although cholera "probably originated in the filth and dirty habits of the devotees who throng the banks of the Jumna and the Ganges, assisted by the miasm and putrescence of those polluted rivers," yet it is made more deadly by lighting in foul places, "where the tone and strength of the population" has been so affected by their circumstances and surroundings as to "vitiate the blood and exalt their susceptibility to deleterious influences," and cause "a chronic disorganization, always attracting the marauding bands of the enemy."

The value of the "English life table," both for vital statistics and life insurance, is shown. The statement that to 41 persons living there is one birth, one death, annually; the rate of mortality is one in 41, and 41 is the mean duration of life, is nearly the fact as to the registry of England.

Under remarks on constitutional diseases, Mr. Farr refers to the fact that human tubercle, when introduced by inoculation, causes tubercular deposit in animals, and thinks that the prevalence of phthisis in the armies of Europe is probably due in part to the inhalation of expectorated tubercular matter, dried, broken up into dust and floating in the air of close barracks. The first appearance and diffusion of rinderpest in England occurred this year.

The next report (1866) considers the evils of the smoke nuisance, and the causes of the vitiation of the atmosphere of the larger towns, and concludes that the action of organic poisons is nearer to fermentation and putrefaction than to any chemical process. In this year cholera was epidemic.

A letter to coroners contains valuable hints as to the different forms of inquest. Even where no one is killed, ought not causes of accident to be investigated?

This report has a separate supplement on the cholera epidemic in England. It had thus far visited England four times—first in October, 1831–32. Many thousands were attacked and perished,

but no registration of causes of death was then kept. All sorts of theories as to "the new disease" prevailed, but "the dreadful suspicion of occult poisoning, which excited the populace to madness and murder, not only in Hungary but in Paris," did not occur in England. The great discovery as to it then was, that cholera, in its worst forms, is preceded by diarrhœa, and that to arrest this is often to arrest the disease. The practical importance of this discovery was well established in the epidemic of 1849 and that of 1854, and led to house-to-house inspection, and to a restraint which, in numberless instances, checked the disease. In the epidemic of 1848–49, the Board of Health, consisting of Lord Ashley, Mr. Chadwick and Dr. Southwood Smith, insisted upon the full applications of this method. The epidemic passed some places, as if for cause. Dr. Snow showed that the "cholera stuff was distributed in all its activity through water." "The terrible outbreak in St. James district inculpated the Broad street pump." Jameson says that the natives of Bengal claim boiled water to be a preventive.

In the third outbreak, that of 1854, Sir Benjamin Hall was President of the Board of Health, and asked of Lord Palmerston a medical board, which was granted, and led to fuller and more permanent inquiries into the public health. Thus, by the year 1866, from the observations of the three great plagues, we had learned enough of the causation of cholera "to justify confidence in its limitation and control, by preventing the distribution of cholera stuff through water, by the early treatment of the premonitory diarrhœa, and by destruction by disinfectants of the cholera flux." Was not that sanitary progress? Dr. Snow held that cholera was disseminated only by contact with the evacuations, or through water containing them. Pettenkofer showed that in Germany the localities "which had the water line nearest the surface had suffered most from cholera. The excretions of cholera patients give the germ." It is easy for living molecules to multiply by millions. The comfort is, that the lower vegetable and animal life is short-lived, and so self-limiting to a certain degree. "The air or the water which one day is poisonous, may, a few days after, be harmless." "The spores of some fungi are ærial, and repel water, but vibrions are true aquatic productions." (*Hassall.*) The effect of elevation, distance, sewerage, wealth and poverty, occupation, sex and age, etc., are discussed. The zymotic theory is fully discussed, as also the practical means to be used to prevent the spread of

the disease. Quarantine, after the methods of former days, is strongly condemned.

In March, 1866, an International Cholera Conference, with representatives from seventeen countries, sat at Constantinople. It discussed the origin, development and mode of propagation of cholera, and the measures of preservation, hygiene and restriction.

When we read of the conditions in India, it is not surprising that cholera originated there. Dr. Barnes gives, as the sole cause, "the exhalations arising from the decomposition of animal and vegetable matter, and the use of water in which this process was continually going on." The whole treatise is a most valuable contribution, not only to the history of cholera, but as a guide to our dealing with other epidemics.

The thirtieth report has comments as to the need of studying weather beyond the scope of mean temperatures, humidity, etc. The need of elementary education as to health matters is enforced, while a summary of improvements made, as showing improvement in health conditions, is given. It is well said that "in estimating the fruits of sanitary labors in the older neighborhoods, *it should not be forgotten that the conditions of populations, increasing rapidly within fixed boundaries, has a constant tendency to deterioration, so that to prevent an increase of average mortality is itself a decisive gain.* New testimony is given to the fact that on the undrained lands of the lower valley of the Thames, and of other English rivers, where their waters are stagnant or sluggish, and thrown out of their channels by mill-dams, thousands of the population suffer from ague, rheumatism and neuralgia, while many die of these and other diseases." Dr. Farr ably discusses the causes of zymotic diseases.

The report for 1868 says "that the great lesson to be derived from vital statistics is to discover the relations which certain results bear to causes under control. The returns of recent years afford proof that some diseases have been brought under control, and it is encouraging to reflect that any sanitary measures adopted to check the ravages of any one epidemic, are operating at the same time more or less *towards the reduction of the virulence of others.*" In 1868 the great sewer system of London, as planned by Bazalgette, was nearly completed.

The appendix contains an account of the Statistical Congress held at the Hague, in 1869. In order to emphasize the number of preventible deaths, it is said that statistics shows that from 1851 to 1861, 30 large towns of England, having a mean aggregate population of

two and a half millions, lost *every year* 32,735 more than would have died had this been subject only to the rate of mortality prevailing in the healthy districts of England.

Drainage is said to have favorably influenced the rate of mortality more than any other one measure. It is only by it and by vegetation and cultivation that malaria can be subdued.

Parasites derived from unhealthy meat, or impure water supply, cause many deaths. The contrast between 352 deaths of men from gout, and but 96 women, is worthy of study.

The report for 1870 notices how scarlet fever seems to recur more frequently, and in its virulence to be an index of insanitary conditions.

A supplement for 1860–70 presents a similar series of tables to that of 1850–60.

The letter of Dr. Farr recounts the changes as to life and health-care which have occurred. In 1771–80, smallpox, in London, was the cause of one hundred in every one thousand deaths; in 1831–5, of twenty-seven, and in 1861–70, of eleven. It is believed that in large ratio we are able to diminish other diseases also. He fully discusses the errors of Malthus, and says: "If Malthus had had before him the returns of produce, as well as of population, in America, he could scarcely have fallen into the error of laying it down that while population increases in a geometrical, subsistence increases in an arithmetical progression."

The progress of mankind in health, the mortality of males and females at the several periods of life, the effect of density of population on health, the march of an English generation through life, the law of mortality and of attacks of disease, the health of men engaged in various occupations, and other matters of great sanitary importance, are discussed.

While mortality increases with density, it is not directly, but as the "sixth root of the density." Examples are given to show how certainly density increases disease, unless sanitary art lends its aid.

"The mean lifetime is found from a life table, which shows how many of a given number born, live through each year of age, and what is the sum of the number of years they live; the sum of these years, divided by the lives, is their mean lifetime. Thus, by the English life table, 1,000 persons live in the aggregate 40,858 years, and their mean lifetime is 40.858, or nearly 41 years. Of their number 303 live to the age of 45; and after that age they live 11.771

years, so their mean after-lifetime at 45, is 23.4 years. This is often called the expectation of life. The given age *plus* the mean after-lifetime, is the mean age at which they die." The pecuniary value of life is alluded to.

The facts as to the effects of occupations are derived from the series of reports for twenty years, in the same classes, at ten different ages.

The various statistics show the value of out-door life; the effect of filth trades, of dust, and especially of metallic dust; of confined work like that of tailors and shoemakers, and various other facts of interest and of practical worth.

It has been found by experience that in England, for one annual death, *two* are on an average constantly suffering from sickness of some severity. There are two years of severe sickness, on an average, to one death.

The thirty-fourth report for 1871 says of the vital returns that "No part of the county need remain in ignorance of the sanitary condition as shown by the proportion of deaths to its population, the number of deaths referred to the principal zymotic diseases, and its infant mortality, measured by the proportion of deaths under one year to births registered."

Smallpox this year ravaged the kingdom as not before since 1838, and caused 16,268 deaths. The letter of Dr. Farr gives many valuable facts as to it and vaccination. A report on "Infant Mortality," by the Obstetrical Society of London, forms a part of the appendix.

The thirty-fifth report discusses the density of great cities, and how the population is to be maintained in health, and shows that registration is a cheap form of inquest. While it is admitted that we have not all the facts in evidence, yet "if the attainable, though imperfect, knowledge of disease suffices for the purposes of medical practice, it cannot be worthless for medical statistics."

Comment is made upon the evils of unskilled attendance upon mothers. A mother's life often hangs on some simple act easily performed by one having knowledge of the mechanism of delivery, but, in the absence of the skillful hand to perform that act, she dies, and carries out of life with her the unborn child.

The report of 1873 shows how the ratio of deaths at all ages may be taken as a fair indication of the sanitary condition of the population, and add the usual extended tables.

The thirty-seventh report cites Wisbech, Orsett and Salisbury, and

other examples of sanitary supervision which have been exercised for long years with excellent perceivable results.

Diphtheria was fatal to 3,560 persons. After the age of forty-five it is more fatal than scarlet fever, and country districts show an undue proportion. Glanders occurred to four men, and hydrophobia to sixty-one. It had shown increase before, and is twice as fatal as twenty years ago. Cancer is noted as worthy of very close study, and especially in view of the fact that 7,541 females and 3,470 males, mostly over the age of forty-five, perished therefrom.

The effects of water and the diarrhœal death-rate of children is studied in the report of 1875. The mean future lifetime of men and women, married and unmarried, is compared. The expectation of life among married men is greater than it is among unmarried men, but the difference between married and single women is not so great.

The thirty-eighth report traces the classification of diseases made first by Mr. Farr, in 1837, and as changed somewhat not long after. In 1847 the causes of death by age and sex were abstracted. Some changes have arisen from new diseases or from a closer knowledge of the old. The tables of 1875 are in accord with the present method.

The thirty-ninth annual report (1876) notes that the increase of dogs or neglect of police regulations does not account for the increase of hydrophobia. The distinction is to be borne in mind between zymotics such as reproduce themselves in successive generations, with various degrees of energy in an infected population, and poisons which, even if of animal origin, comport themselves more like chemical bodies. The poison of hydrophobia represents the one, and that of the cobra capella the other. While the first reproduces itself, the venom of the latter is not reproduced in the animal bitten.

The food value of alcohol is discussed: its possible importance as such noted. The causes of death to mothers are stated, and the need of training for those who attempt skilled oversight.

The fortieth report, containing the abstract for 1877, was made in 1879. The report first traces the marriages for ten years as an index of depression and prosperity, while 1870–73 showed a high marriage rate.

The years of prosperity were followed by four of stagnation. The marriage rate (or persons married, to 1,000 living,) was 15.9 in 1869, 16.1 in 1870, 16.7 in 1871, 17.5 in 1872, and 17.6 in 1873. It fell to 17.1 in 1874, 16.8 in 1875, 16.7 in 1876, and 15.8 in 1877. It is thus seen how quickly commercial or trade conditions affect the social

status of population. Similar facts prevail as to births. To ascertain the number of births to a marriage, the annual births are divided by the annual marriages of a previous year. The uniformity with which there is an excess of males over females, also points to a law of provision for various casualties and exposures. The rate of illegitimacy in different countries and through a series of years, is shown to depend much upon the proportional number of unmarried females living during the child-bearing age.

The reduction in death-rates for twenty-three and a half years was found to be equal to 12.2 per cent. in the urban and 8.5 per cent. in the rural districts.

In the Meteorological Report of James Glaisher, F. R. S., the subject is considered in the following order: Atmospheric pressure, temperature, rainfall, wind, thunder storms, lightning, solar halos, lunar halos, aurora borealis, snow, hail and fog.

Dr. Farr discusses the density and proximity of population, its advantages and disadvantages, and the present provision of parks in the great towns.

Even so brief a summary indicates the indispensable importance of the work which has been thus done under the direction of the English government, as a guide to all those attempting similar statistics for our States.

CLIMATOLOGY

AS RELATED TO HEALTH AND CHOICE OF LOCALITY, WITH ACCOMPANYING TABLES.

The object of the study of the conditions of weather, in connection with a report on vital statistics, is to determine the relations which these conditions bear to the causation or progress of disease.

"Meteorology is the science which treats of the atmosphere and its phenomena. Climatology is the science which treats of the causes which affect the *climate of a particular place*. By the climate of a place we understand its peculiar condition with respect to temperature, moisture and other atmospheric phenomena. By weather we understand the condition of the atmosphere *at a particular time*, with respect to temperature, moisture, winds, cloudiness, etc."

We become acquainted with these by two kinds of observation. First there is that made in the use of instruments of precision, by which we are able to express by figures, or in description, the temperature, the moisture, and other particulars bearing upon the weather. These not only suppose correct instruments located in proper positions, but also the care of accurate and skilled observers. Hence the observations, to be reliable, must be made by those of certified and approved skill, who are themselves instruments of precision, and promptly record the results indicated.

The comparisons of these results in different localities, and in the same locality for different years, aid much to define the variations of climate and the weather conditions of each place.

Sources of error are eradicated by records over long periods. The laws of mutation are found to be as uniform in respect to series of years as they are as to seasons. A corresponding closeness in observation of epidemics, and of more general diseases, shows that climate has power to produce or to modify disease. It is only by the com-

parison of the statistics of the weather, and the statistics of disease, side by side, over shorter and longer periods, that we are in the line of discovering the relations of the two. For purposes of large and extended comparison it is important that the State have such records quite fully. This does not supersede the importance of a close record in districts, and especially in those large cities in which the weekly relations of weather to disease need to be noticed, in order to ward off the known effects which certain changes produce upon the population of particular parts or wards.

But this is not the only kind of observation. Prof. C. F. Brackett, in his able article on meteorology as an aid to the physician, (*Third Report, pp. 93–100,*) insists "that the habits of local showers and the domestic fog bank must be studied by the prophet of every neighborhood which presents any peculiarity of feature or position, as must also the higher clouds and prevailing winds, and indeed everything that can contribute to the end in view." A comparison of the two is needed. Especially medical men in their study of disease must also be observers of the effect of weather changes, in that accurate way which ere long gives assistance, both in prevention and treatment. Dr. Farr also remarks "that climate should always be considered in reference to the indigenous inhabitants, and to strangers, and to the natives either of a similar or different climate." (*Registrar's Report, Vol. II, p. 88.*)

There are many factors that enter into the constitution of the weather of any particular region or locality. Those that have to do with longitude and latitude and altitude are generally recognized. But there are other modifications arising from the earth. The relations of land and water, the interspersions of islands and lakes, the shapes and exposure of mountains and valleys, the presence and frontage of woods and great forests have much to do with moisture, evaporation and the effect of sunshine. The geological formation and the soil, the drainage, the powers of the surface as to the retention or radiation of heat and the degree of cultivation and the kind of growth upon the surface, all exert their influence upon the climate; an influence in some regards definite and appreciable, and as much subject to variation by the art and device of man as any other of the laws affecting life. As we have far more to do with the earth than with the sky, it is most important that we study all these influences, and how far and in what way they are under our control, so that we may induce such modifications as are favorable to health and life.

As to those influences which are more purely atmospheric, we need to know these with accuracy, in order that we may know what may be anticipated in each district, and thus suit the choice of homesteads to prevailing conditions, or in case of certain proclivities to disease, adapt our choice of residence to the demands of our own constitutions.

At the commencement of the present system of vital statistics, the Board issued the following form of record, in order to secure such data as are needed in the study of climatology:

METEOROLOGICAL REGISTER FOR THE STATE BOARD OF HEALTH OF NEW JERSEY.

For the Month of .... *188* , *at* .... *by* ....

Day of month, name of 1st day.	Thermometer in Open Air. 7 A. M.	Thermometer in Open Air. 2 P. M.	Thermometer in Open Air. 9 P. M.	Thermometer in Open Air. Daily mean.	Dry and Wet Bulb Ther. 7 A. M. Dry bulb.	Dry and Wet Bulb Ther. 7 A. M. Wet bulb.	Dry and Wet Bulb Ther. 2 P. M. Dry bulb.	Dry and Wet Bulb Ther. 2 P. M. Wet bulb.	Dry and Wet Bulb Ther. 9 P. M. Dry bulb.	Dry and Wet Bulb Ther. 9 P. M. Wet bulb.	Humidity, Sat. being 100. 7 A. M.	Humidity, Sat. being 100. 2 P. M.	Humidity, Sat. being 100. 9 P. M.	Registering Thermometer. Maximum.	Registering Thermometer. Minimum.	Registering Thermometer. Mean	Registering Thermometer. Range.	Barometer. 7 A. M. Barometer.	Barometer. 7 A. M. Thermometer attached.	Barometer. 2 P. M. Barometer.	Barometer. 2 P. M. Thermometer attached.	Barometer. 9 P. M. Barometer.	Barometer. 9 P. M. Thermometer attached.	Barometer reduced to 32°. Mean.	State of Sky. 7 A. M. Per ct. of cloud.	State of Sky. 2 P. M. Per ct. of cloud.	State of Sky. 9 P. M. Per ct. of cloud.	Winds. 7 A. M. Direction.	Winds. 2 P. M. Direction.	Winds. 9 P. M. Direction.	Rain and Snow. Beginning rain or snow	Rain and Snow. Ending rain or snow.	Rain and Snow. Inches rain and melted snow	Rain and Snow. Depth of snow.	Summary for the Month.	Remarks as to Thunder and Lightning, Hail Storms, Aurora Borealis, Solar and Lunar Halos, Mists, Haziness, Frosts, Prevalent Diseases of Men and Animals, Plant Life, Destructive Insects, etc.
1																																			THERMOMETER (Dry).	
2																																			Mean .... Degrees.	
3																																			Maximum .... Degrees.	
4																																			Minimum .... Degrees.	
5																																			Range .... Degrees.	
6																																			THERMOMETER (Wet).	
7																																			Mean .... Degrees.	
8																																			Maximum .... Degrees.	
9																																			Minimum .... Degrees.	
10																																			Range .... Degrees.	
11																																			HUMIDITY (Sat. being 100).	
12																																			Mean	
13																																			Maximum	
14																																			Minimum	
15																																			Range	
16																																			BAROMETER.	
17																																			Mean .... Inches.	
18																																			Maximum .... Inches.	
19																																			Minimum .... Inches.	
20																																			Range .... Inches.	
21																																			RAIN.	
22																																			Total am't of Water ...... Inches.	
23																																			Duration ...... Hours ...... Minutes.	
24																																			SNOW.	
25																																			Total amount .... Inches	
26																																			Ground covered with Snow, how	
27																																			many Days	
28																																			Date of First Frost	
29																																			Date of Last Frost	
30																																			Days Frost in each Month	
31																																			Days of Thunder Storms	

DIRECTIONS.—Mark for No Clouds, 00; Entire Cloudiness, 100; In part, expressed by tens; kind of clouds: Cu.—Cumulus; Cir.—Cirrus; Nim.—Nimbus; St.—Stratus; Record Winds in the direction from which they blow by the usual 8 points, as from N., W., E., etc; figures along side will denote as follows: Breeze (2); Strong Wind (4); Gale (6); Violent Gale (8); Tornado (10). When rain is accompanied with thunder and lightning, mark on the rain column Th. The readings of the Barometer represent Atmospheric Pressure, and the record of Rain and Snow the Atmospheric Precipitation.

In cities it might be well to record the daily mean humidity, and to *add range* in the column of "Registering Thermometer," as here.

As the time required for our Report is December, and the record of vital statistics cannot be completed for any one statistical year, up to the date of report, we make the statistics of the weather to conform as to time to the statistics of vital record, and so tabulate from July 1st to July 1st of the ensuing year. As other comparisons need to be made, either quarterly or half-yearly, or from January to January of each succeeding year, the tables will be so arranged as will enable students of these subjects to make the needed comparisons. In these tables will be given all the data that are needed for comparisons of weather and disease, although not such fullness of detail as is generally found in meteorological reports.

The slight changes from the printed form heretofore furnished observers will not prevent its use. The only column change suggested is under the head of registering thermometer, to substitute *range* for mean, since the daily mean of "thermometer in open air" serves to express this. The "daily range" is valuable in calculation, if the thermometer is in the same place, although some prefer both. We have also added in the summary for the month: Date of frost; date of last frost; number of days of frost in each month; days on which thunder storms occurred. Some also note dews. These are not all important in the usual records. But in this State great diversity is shown, and in the study of health resorts, such data are important. It is quite remarkable, for instance, how Cape May is exempt from frost, when places in lower latitudes are not, and what varieties of climate adapted to particular temperaments and ailments can be found in this State. Accurate records kept by local authorities, through a series of years, would lead to the establishment of climatic rules, reliable and valuable as indices of where to locate. The form of summary which seems most desirable for our purpose is similar to that given by Prof. Rockwood, on page 205 of our fourth Annual Report, of which a specimen is here subjoined.

METEOROLOGICAL SUMMARY FOR 18—.

Station, Bayard Avenue, Princeton, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 Feet.

OBSERVER, ——— ———.

	BAROMETER. (Reduced to 32 degrees.)			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equalled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
188–. July												
August												
September												
October												
November												
December												
188–. January												
February												
March												
April												
May												
June												
For the Year												

* Including melted snow.

The days when precipitation equalled 0.01, helps in studying the influence which "the exchanges of moisture that are always in progress between any object and its surroundings may have on life and health." While absolute uniformity of tables is not required, we ask our observers to conform thereto as far as consistent with their own methods. We leave a space at the end of every three and six months in order that separate averages may be made for the quarter or half year. Then the summary of remarks for the year may be added briefly, including other particulars alluded to in our form for "Monthly Summary" and "Remarks." As a specimen, we subjoin

the form of remarks and specifications with which James Glaisher, Esq., F. R. S., of the Royal Observatory at Greenwich, has usually accompanied the vital records of the Registrar General, of England.

[Specimen Report.]

REMARKS ON THE METEOROLOGY OF THE YEAR ——.

BY JAMES GLAISHER, ESQ., F. R. S., &C.

The year —— was remarkable for its low temperature, particularly in January, November and December, when the weather was inclement; the spring and summer were cold and wet. There was an unusual amount of cloud during the year, and consequently very little sunshine. Until the end of September the readings of the barometer were generally below the average, and rain was in excess during these months, excepting March, which was dry. Snow fell very frequently, and fog was unusually prevalent. The temperature of the whole year was the lowest in this century, excepting only that of 1814, and it was a bad one for agricultural work.

Atmospheric Pressure.—Till September 24th the reading of the barometer was generally below its average, the exceptions being the 17 days ending February 1st; the 14 days ending March 14th; the 28 days ending May 25th; the eight days ending July 30th, and the five days ending September 4th; the average daily excess of these 72 days was 0.17 inch, and the mean daily defect below the average of the remaining 195 days was 0.23 inch. From September 25th to the end of the year, with the exception of a few days, the reading was high, and the average excess of daily pressure for these 98 days was 0.28 inch. Thus the readings of the barometer were low for the first three quarters of the year, and high during the last quarter. The lowest reading in the year at Blackheath was 28.63 inches, on February 10th, and the highest was 30.62 inches, on December 22d, so that the range of reading in the year was 1.99 inch. The day of lowest mean reading was February 10th, when it was 1.05 inch below the average, and the day of highest reading was December 23d, when it was 0.66 inch above its average.

Temperature.—With the exception of the 11 days ending February 16th, and the 17 days ending March 20th, there were not 7 consecutive days during the year on which the temperature reached its average. From the beginning of April to the end of July the average daily deficiency of temperature was 3° nearly, and from November 20th to December 27th it was as large as 9½° daily. The temperature of every month was below its average of 60 years, and there is no other instance back to 1771 of such being the case.

The highest temperature in the year was 81°.5 at Cambridge, 80°.8 at Carlisle, 80°.4 at Blackheath, 80°.3 at Cockermouth and Royston, 80°.2 in London, and 80°.0 at Barnstaple, Streatley and Somerleyton; the lowest reading was 1° both at Cambridge and Stockton, near Rugby, 1°.5 at Silloth, 2°.0 at Cardington, and 3°.0 at Leicester.

Rain.—There was an excess of rain in every month excepting March, and the last three months of the year; this excess being particularly great in the months, May to August. The greatest total fall in the year was 56.77 inches at Sharples, near Bolton, the next in order being 47.71 inches, at Helston, 42.4 inches at Stonyhurst, and the least was 26.19 inches at Carlisle; the next in order being 27.10 inches at North Shields, 27.41 inches at Lowestoft. The greatest number of days on which rain fell was 240 at Bradford, 225 at Bywell, 223 at Stonyhurst, and 215 at Truro.

Thunder Storms occurred on 64 days in the year; they were as follows:—One at Helston, on January 14th; 2 in February, at Guernsey and Plymouth, on the 6th and 20th; 1 in March, on the 30th, in Yorkshire; 5 in April, evenly spread over the country; 7 in May; none in the South; 13 in June, chiefly in the Midland and Northern counties; 10 in July, chiefly in the North; 15 in August, general everywhere; 6 in September, chiefly in the North; 1 in October and 3 in December, at the Southern stations.

Thunder was heard but lightning was not seen on 75 days, viz.: 5 in March, 10 in April, 10 in May, 15 in June, 14 in July, 14 in August, 5 in September, 1 in October and 1 in December.

Lightning was seen but thunder was not heard on 42 days, viz.: 5 in February, 3 in March, 3 in April, 1 in May, 9 in June, 6 in July, 12 in August, 1 in September and 2 in November.

Solar halos were seen on 68 days in the year, the greatest number in one month was 12, in June.

Lunar halos were seen on 39 nights; none were seen in the months May, June and July.

Snow fell on 26 days in January, but on only one day, the 10th, in Guernsey, Cornwall and Devonshire; it fell on 23 days in February, on 16 in March, on 14 in April, and on 8 in May; in April and May no snow fell at Guernsey or in Cornwall, but it was pretty general elsewhere; it fell in July at Bolton, on the 4th and 8th, and at Cockermouth on the 9th; it fell on two days in

the middle of October (the 14th and 15th), in the north of England, on 16 days in November, and on 1[?]in December. Up to May 31st snow fell on 87 days, and altogether on 119 days in the year. It fell at many places on January 1st, and at a few places on December 30th.

Hail fell on 126 days in the year, on 76 days up to June 30th, and on 50 days in the second half of the year.

Fog was very prevalent throughout the year; it occurred at one or other stations on 18 days in January (mostly north of London), on 20 days in February (chiefly in the Midland counties), on 14 days in March, on 14 days in April, on 21 days in May (but many stations, particularly in the middle of the country, were free from fog), on 10 days in June, on 18 days in July (chiefly at Torquay and Allenheads, at other stations on one or two days only), on 18 days in August (but 11 of these days were noted at Torquay—at most stations where fog is returned it was on one or two days only, and at many no fog was observed), on 18 in September (chiefly between the latitude of 52° and 54°), on 21 days in October (but scarcely any at stations south of latitude 51½°), on 18 in November (only at stations north of 51½°), and on 26 days in December (on 3 or 4 of these days in the south, on 10 or 12 at several places in the Midland counties, and on 1 day only at Carlisle, and at some stations in the north there was scarcely any fog).

While our observers will need to make the same records as heretofore, we shall ask for publication in the report only the above table, with the remarks of the observer appended. Any facts as to the diseases of each period, or as to the effect of sudden changes as noticed, may be referred to.

While occasionally furnishing tables of other localities, we choose such points for continuous yearly observations as represent different geological structures and sectional geographical positions. Thus the station which, through the liberality of A. L. Dennis, Esq., of Newark, has been established at

(1) *Newton*, will represent the most northern section of the State, as well as the sandstone, slate and adjacent rock.

(2) *Paterson* well represents another northern section located on trap rock.

(3) *Newark*, with quite diverse geographical surroundings, stands for the east red sandstone section.

(4) *Princeton*, *New Brunswick* or *Trenton* may stand for the whole shale region between, and the tables of either would answer.

(5) *Freehold*, amid the sand and clay marls of the western part of Monmouth county, represent another section.

(6) *Vineland*, on the sandy clay of the south, central and interior portion of the State, will represent the large adjacent region.

(7) *Cape May*, on the similar sandy formation, but as representing the extreme point on the Atlantic coast, is also desirable.

(8) *Middletown* represents our northern coast.

To these the student of climatology as related to disease, may easily add the observations of Barnegat and Sandy Hook, as furnished by the Signal Service, and as standing for a higher latitude of sea coast exposure.

In addition, the observations had at New York city, Philadelphia

and Easton, as made in those cities, will well represent adjacent portions of this State, which perhaps may hereafter need special study in the interests of Jersey City, Camden and Phillipsburg, and for climatic comparisons.

The materials for comparison of vital statistics, date from the third report, since its tables were the first ordered and completed under the present law. Its records reach from July 1st, 1878, to July 1st, 1879. The climatology for that year, as there given, is only that of Newark, Princeton and Vineland, pp. 143–150.

That from July 1st, 1879, to July 1st, 1880, pp. 195–207, fourth report, gives returns from Newton, Paterson, Newark, Princeton, Freehold and Vineland, with an additional table for Barnegat and Middletown. The former represents our middle coast, while for our purposes Middletown is fully equal to Sandy Hook as a place of record. If the record of Cape May and other Signal Service coast stations are not always given by us, they will be available and used when semi-decennial or decennial comparisons are made.

This year the seven places already designated will be secured, or points representative of them. By another year we shall hope to have tables for comparison which will represent all these districts from July 1st, 1878, the date at which the new forms of vital statistics commence, and in better shape for comparison.

Brief remarks should accompany the condensed summary for the year.

We shall now soon have opportunities for comparison of vital and weather returns and of the contrasts of localities for five years, and shall hope, with other observers, to be able to arrive at some conclusions therefrom. At present we confine the notes to weather conditions, mostly to the last statistical year and to the six months from July 1st to January 1st, 1882.

For the year, from July 1st, 1880, to July 1st, 1881, the following are the most noticeable facts: The preceding winter, that of 1879–80, was unusually mild. This was true in the middle and the northern part of the State, and at Vineland the year was 8 per cent. above the average temperature, and 13 per cent. above the cold year of 1880–81. The rainfall was only three-fourths our usual winter average. The early months of 1880 were mild, while the spring months of March and April were backward, with a diminished rainfall in April. The dryness of the winter had caused lowness of the springs and wells, which was not compensated for by any rains of the spring months. The early spring and summer months were characterized by absence of rain and

high temperature. The report at New Brunswick, for instance, says of the month of May: "It was unusually warm, and the maximum temperature of the year was reached on the 26th of that month, above that of any preceding May ever observed here. The mean temperature also exceeding the mean for years (from November 1st to November 1st) by 8 degrees. From the 20th to the 28th the daily maximum ranged from 85 to 98 degrees—a hot period quite as long and as intense as those of our hottest summers. June, also, was marked by its high temperature and long-continued heat periods. The rainfall of the three months, April, May and June, was very deficient, amounting to 2.68 inches, whereas the mean for these months is 12.05 inches. It was a most serious drought, as there was no rain between April 29th and May 30th. While we saw some of the effects of this on the last quarter of the death-rate, from July 1st, 1879, to July 1st, 1880, it is still more apparent in the largely increased death-rate of the year from July 1st, 1880, to July 1st, 1881. Our last report shows a similar record for Newark, Paterson and Vineland. J. S. Hilton, C. E., of Paterson, says the drought in duration may be stated as one lasting eight months, and a drought of that extent may be safely recorded as having never been equalled, at least within the memory of the oldest inhabitant. Thus the first half of the present statistical year, viz., from July 1st, 1880, to January 1st, 1881, had all the burden of this drought, accompanied with high temperature.

The first quarter of 1881 was marked by a severe degree of cold. The mean monthly temperature was in January about 4 degrees below the average for the last five years; in February, over 3 degrees below, and in March over 2. The ground in all the counties above Trenton was covered with snow throughout January and February. Although this and the rains raised the springs, yet the severe drought of the former year was not fully compensated. The cold of March extended late into April, so that the first month of the second quarter had a temperature about 4 degrees below the last semi decennial average. May and June were also the same number of degrees below the average. The rainfall of April at New Brunswick was only .43, as against the average of 3.68 inches for the last 27 years. The severe drought of the summer did not commence until about the 1st of July. The warm summer of 1880 and the cold winter of 1880–81 were the chief factors in the increase of intestinal and pulmonary diseases. The records show the effect of these changes, and should be the subject of future study as to seasonal influences.

METEOROLOGICAL SUMMARIES FOR CHOSEN STATIONS IN ORDER FOR COMPARISONS WITH DISEASE AND WITH VITAL STATISTICS.

NOTE.—Those of Newton come nearest our desire as to forms, in order to admit of ready comparisons. It is well to leave a space at each quarter year (not carried out), in order that cities where death-rates need oftener to be compared, may insert a quarterly summary. The Board would express its great obligations to all our observers for aid in adapting methods for special climate study in reference to health and disease.

(*a*) Summaries for the period from July 1st, 1880, to July 1st, 1881.

(*b*) Summaries from July 1st, 1879, to July 1st, 1880, years in form for vital statistic comparison.

(*c*) Summary from July 1st, 1878, to July 1st, 1879, in form for vital statistic comparison.

(*d*) Summary for part of year since July 1st, 1881, for Newton, and for the whole of year 1881 for Vineland and New Brunswick.

METEOROLOGICAL SUMMARY FOR THE PERIOD FROM JULY 1ST, 1880, TO JULY 1ST, 1881.

Station—Dennis Library, Newton, N. J. Latitude, 41° 2′ 45″ N. Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	BAROMETER. (Reduced to 32 degrees.)			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation Equalled 0.01.	Cloudy Days.	Rainfall on Days.	Thunder and Lightning on Days.	Snowfall on Days.	Fog.	Hail.	Frost.	Lunar Halos.
	Max.	Min.	Mean.	Max.	Min.	Mean.													
1880.																			
July	†	†	†	90.0	62.0	74.73	†	N. W.	†	......	9	10	13	2	......	2	......	......	......
August	†	†	†	88.0	51.0	72.63	†	S. W.	†	......	6	8	8	1	......	......	......	1	......
September	†	†	†	88.0	48.0	66.53	†	S. W.	†	......	6	11	7	......	......	......	......	2	......
October	29.681	28.750	28.965	77.1	29.8	50.99	70.3	S. W. and N. W.	1.70	......	9	12	11	......	......	2	......	7	......
November	29.914	28.851	29.459	67.3	10.5	36.67	67.1	S. W.	1.68	3.0	10	15	12	......	6	2	1	3	......
December	29.684	28.910	29.249	45.0	-7.9	25.62	74.6	N. W. and S. W.	2.73	15.7	12	21	5	......	13	......	1	1	......
1881.																			
January	29.862	28.620	29.341	43.3	-5.0	21.83	74.97	N. E. and N. W.	4.06	20.25	9	18	5	......	12	......	1	......	......
February	29.997	28.639	29.068	56.0	-6.0	28.82	68.25	N. W. and N. E.	0.60	6.5	5	11	3	......	3	2	......	......	2
March	29.580	28.332	28.993	58.0	17.0	35.80	68.0	N. E. and N. W.	†	5.0	7	16	5	......	5	......	2	......	......
April	29.569	28.579	29.118	83.0	17.0	47.22	53.18	N. W.	†	Trace.	2	7	2	......	1	......	......	......	......
May	29.735	28.874	29.294	95.0	30.5	61.30	70.0	S. W. and N. E.	†	......	8	9	9	3	......	......	......	......	......
June	29.421	28.910	29.017	88.7	40.3	65.17	70.38	N. W. and N. E.	5.12	......	16	18	17	5	......	1	......	2	1
For the year	29.719	28.385	29.167	81.2	23.9	48.94	68.53	......	15.89	50.45	99	151	97	11	40	9	5	16	3

* Including melted snow. † No observations taken.

METEOROLOGICAL SUMMARY FOR 1880 AND 1881.

City Surveyor's Office, Paterson, New Jersey. Latitude, 40° 55′ N. Longitude, 74° 11′ W.

BY JOHN T. HILTON, C. E.

MONTH.	BAROMETER. (Reduced to 32 degrees)			THERMOMETER.			Mean Humidity.	Prevailing Winds.	Rain (inches).*	Snow (inches).	Days when Precipitation Equalled 0.01.	Cloudy Days.	REMARKS.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1880.													
July	....	....	....	92.0°	61.0°	79.0°	....	S. W.	12.06	....	12	....	Remarkably heavy rainfall. No record as heavy for the month.
August	....	....	....	93.0	52.0	74.0	....	S. W.	6.92	....	10	....	
September	....	....	....	93.0	48.0	68.0	....	S. and N.	3.36	....	6	....	
October	....	....	....	69.0	33.0	58.0	....	W. and S. W.	5.57	....	9	....	
November	....	....	....	67.0	9.0	41.0	....	W.	5.60	3.50	10	....	First snow on 25th.
December	....	....	....	47.0	6.0	28.0	....	N. W.	2.41	14.00	9	....	
1881.													
January	....	....	....	44.0	−3.0	25.0	....	W. and N. W.	7.33	18.25	8	....	
February	....	....	....	57.0	−5.0	26.0	....	N. and N. W.	6.95	10.25	11	....	During the month, 3.21 in. fell in 7 hours.
March	....	....	....	54.0	24.0	36.0	....	W. and N. W.	16.11	1.50	10	....	Remarkably heavy rain, 12.45 in. above the mean.
April	....	....	....	82.0	24.0	46.0	....	W. and N.	1.74	....	4	....	
May	....	....	....	87.0	35.0	63.0	....	S. W.	3.69	....	11	....	
June	....	....	....	86.0	49.0	66.0	....	S. E. and S.	11.74	....	14	....	Very heavy rainfall, 7.41 above the mean.
For the year	....	....	....	72.7°	27.8°	50.4°	....	....	83.48	47.50	114	....	A remarkable rainfall for the year. In Dropus table of rainfalls for the vicinity of New York, the heaviest annual amount is in 1868, amounting to 64.13 in.

*Including snow.

TEMPERATURES, RAINFALL, &c., AT FREEHOLD, N. J.,

From July 1st, 1880, to June 30th, 1881, from the records of CHAS. F. RICHARDSON, Vol. Observer for Signal Service.

MONTHS.	MINIMUM TEMP'TURE. Date.	MINIMUM TEMP'TURE. Degrees.	MAXIMUM TEMP'TURE. Date.	MAXIMUM TEMP'TURE. Degrees.	Monthly Mean Temperature.	Rain or Snowfall on Days.	Total Rainfall or Melted Snow (inches).	Mean Relative Humidity (per cent.)	Prevailing Winds.	Thunder and Lightning on Days.	Depth of Snowfall (Inches).
1880.											
July	30	54.	9	90.	73.91	15	8.57	78.7	N. W.	13	......
August	16	50.	25	89.	74.34	9	4.17	81.0	S.	9	....
September	23	46.	5	88.	65.21	6	2.87	79.6	W.	3	....
October	25 & 26	31.	16	79.	51.14	11	2.61	77.0	N. W.	....	....
November	24	9.	5	65.	36.98	10	3.44	72.6	W.	1	4 3
December	30	-11.	5	49.	25 52	12	6.58	73.2	N. W.	....	51 2
1881.											
January	1	-7.	13	41.	22.50	12	7.85	75 3	W.	....	9.8
February	2	-6.	28	58.	27.25	12	6 33	80 1	N. W.	1	11.4
March	2	20 5	16	59.	36.26	11	7.14	75.6	N. W.	1	3.
April	5 & 7	21.	24	76.	44.94	5	1.07	70.6	N. W.	1	....
May	4	35.	12	91.	60.95	13	2.78	80.7	S. E.	7	....
June	7	47.	29	90.	64 45	16	7.78	81 3	N. W.	9	....
Totals	....	287.5	....	870.	583.45	132	61.19	925.7	....	45	79.7
Means	....	23 9	....	72.5	48 62	11	5.09	77.1	N. W.	3.7	....

The records retained here begin with April, 1875, though the work began in March, 1873.

From the summary on file here, the following is taken: Highest temperature, 102°, September 7th, 1881; highest previous, 98°, July, 1876; lowest temperature, as above, in December, 1880; lowest previous, –3°, January, 1879. Greatest rainfall in any one month, 10.67 inches, August, 1875; least rainfall in any one month, 0.55 inch, August, 1876. The records of humidity began November 1st, 1875. Highest monthly relative humidity, 92.7 per cent., in October, 1877; lowest monthly relative humidity, 57.5 per cent., April, 1876. The thermometers used are Green's signal service pattern. The rain-gauge is from the headquarters of the service at Washington. The thermometers are in the model shelter that was on the Government Building at the Centennial, and correctly located.

METEOROLOGY OF VINELAND, N. J.—For Vital Statistic Comparison, from July 1, 1880, to July 1, 1881. Elevation above Sea Level, 105 feet. Latitude 39° 38′.

	BAROMETER.				TEMPERATURE, CLOUDS, ETC.											WIND.								
	Maximum.	Minimum.	Mean.	Range.	Maximum.	Minimum.	Mean.	Range.	Dew Pt.	Humidity.	Degree of Cloudiness.	Clear Days.	Clear Observations.	Rain.	Rainy Days.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Total.
1880.																								
July	30 024	29.560	29 838	.464	93°	56°	76 45°	42°	67.60	68	6.07	0	27	8 64	8	9	6	0	12	3	37	1	25	93
August	30.230	29.592	29 909	.638	90	50	73 03	40	65.77	62	7 66	0	13	6.64	8	4	20	1	12	5	41	1	9	93
September	30.160	29.590	29 899	.570	92	44	66 83	48	57 56	63	6.16	1	27	2.94	5	4	11	2	12	5	29	8	19	90
Mean	30 138	29 581	29 882	.557	93	50	72.10	43 1-3	60 31	64	6.60	⅓	22⅓	6 07	7	5 2-3	12 1-3	1	12	4⅓	35 2-3	3 1-3	17⅔	...
October	30.269	29 120	29.965	.849	80	30	54.11	50	44 14	71	4 59	11	45	2 75	9	9	16	4	5	10	24	7	18	93
November	30 591	29 500	30 076	1.091	67	9	38 22	58	25.07	63	6.42	4	29	4 44	9	6	10	0	13	4	22	16	19	90
December	30.320	29.534	29 910	786	50	-10	26 23	60	16.16	56	6.31	4	29	7 53	10	6	10	1	3	3	18	13	37	93
Mean	30 394	29.485	29 981	.909	66	10	39 52	56	28 46	63	5.77	6⅓	34	4.91	9⅓	7	12	1 2-3	7	5⅔	21 1-3	12	21⅔	...
1881.																								
January	30 489	29.158	29 998	1 331	46	-10 1-2	25 31	56 1-2	14 74	61	7 01	1	23	2.82	12	3	20	1	4	2	12	10	41	93
February	30 601	29.310	29 927	1 291	58	-6	29 96	64	20.41	61	5.17	5	37	2 26	7	9	13	1	13	4	8	10	26	84
March	30 072	28 880	29.549	1.192	62	22	28 86	40	30.45	76	7.07	2	22	6.35	13	2	10	5	6	3	15	16	35	93
Mean	30.254	29 116	29 825	1 271	55	1 5-6	28.04	53 1-2	21.86	66	6.42	2⅔	27	3.81	10⅔	4 2-3	14 1-3	2 1-3	7⅔	3	11 2-3	12	34	...
April	30 070	29 397	29.754	763	55⅓	1 5-6	47 36	53 1-2	38 78	69	6 09	2	26	2 61	10	1	8	5	9	4	19	20	24	90
May	30.248	29 192	29.879	.746	88	26	64 24	62	55 86	72	6.02	5	31	2 00	5	2	20	5	21	6	31	2	6	93
June	29 978	29 518	29 737	.460	94	54	69.74	40	61.78	80	7.35	1	18	3 05	5	10	17	1	9	3	25	9	16	90
Mean	30 099	29.439	29.790	.656	79	31	60.44	51 5-6	52 14	73	6.49	2⅔	25	2 55	6⅔	4 1-3	15	3 2-3	13	4⅓	25	10 1-3	15⅓	...
Mean of Year	30.299	29.405	29 870	.848	73	33	50.02	51.16	40.69	66	6.32	3	27	4.35	4½	5 5-12	13 5-12	2 1-6	10	4⅓	23 5-12	9 5-12	23	...
Sums	....	....	....	....	....	....	....	....	....	...	....	36	324	52.20	102	65	161	26	120	52	281	113	276	...
Extremes for Year	30 601	28.880	30 076	1.721	98	-10 1-2	76.45	108 1-2	....	...	....	....	....	....	....	....	....	....	....	....	....	....	....	...

	Temperature.	Dew Pt.	Hygrom.	Degree of Cloudiness.	Cloudy Days.	Clear Observations.	Rain.	Rainy days in month.	WIND. N.	N. E.	E.	S. E.	S.	S W	W.	N.W.
Means, 1878–79	52.88°	48.38	81 5	5 95	3 58	28 91	4 02	8 33	66	112	24	121	56	341	80	295
Means, 1879–80	57 07	61.00	76.0	6.04	2.58	29 08	3 82	7 83	78	101	23	93	80	369	75	276
Means, 1880–81	50.02	40 69	66 0	6.32	3 00	27.00	4.35	4.50	65	161	26	120	52	281	113	276
Mean of all Means	53 32	50.24	74.5	6.10	3.05	28.33	4.06	6.89	70	125	24	111	63	330	89	282

METEOROLOGICAL SUMMARY FOR 1881.*

From Observations at Newark, N. J., by Hon. W. A. WHITEHEAD, Newark, N. J.

	BAROMETER.			THERMOMETER.			Prevailing winds between.	Inches rain and melted snow.	Inches of snow.	Fair days.	Rain on days.	Snow on days.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.						
January	30.660	29.400	30.173	40.25	0.12	24.45	W. N.W. and N. N.W.	5.060	14.50	19	5	9
February	30.850	29.450	30.240	51.25	-3.00	27.95	N.E. and S E.	4.645	10.50	19	7	5
March	30.380	29.170	29.830	57.00	21.75	37.27	N.W. and S.W.	6.835	1.50	14	11	7
April	30.314	29.502	29.943	80.75	22.00	48.53	N.W. and S W.	1.715	....	21	6	2
May	30.460	29.512	30.086	92.50	38.00	64.12	N.E. and S.E.	2.917	....	19	12	—
June	30.200	29.652	29.920	90.00	49.50	66.75	N.E. and S.E.	5.040	....	13	13	—
July	30.250	29.650	29.938	95.00	59.25	75.07	N.W. and S.W.	1.340	....	12	7	—
August	30.520	29.650	30.027	98.60	56.50	75.65	Equally between E. & W. horizons.	0.280	....	22	5	—
September	30.350	29.900	30.129	100.50	50.75	73.72	N.E. and S.E.	0.570	....	17	7	—
October	30.580	29.624	30.191	83.00	33.75	57.94	N.W. and S.W.	2.730	....	19	10	—
November	30.650	29.630	30.197	68.75	22.25	44.11	N.W. and S.W.	3.075	11.25	17	12	2
December	30.628	29.400	30.198	66.50	19.50	39.00	N.W. and S.W.	4.635	2.25	16	14	3
For the year	30.850	29.170	30.073	100.50	-3.00	52.88	....	39.032	31.00	208	109	28

* Rate given with these for the V. S. year for comparison.

TABLE OF TEMPERATURE FOR THE YEAR FROM JULY 1st, 1879, TO JULY 1st, 1880.

Station—Newton, N. J. Latitude, 41° 2′ 45″ N. Longitude, 2° 19′ 48″ E. Altitude, 660 feet.

Compiled by Miss E. Foster.

	Thermometer.			Prevailing Wind.	Rainfall on Days.	Days when Precipitation Equalled 0 01.	Cloudy Days.	Thunder and Lightning on Days.	Snowfall on Days.	Fog.	Hail.	Frost.	Depth of Snow (inches).	Remarks.
	Max.	Min.	Mean.											
1879.														
July	96.0	60.0	60.29	S. W.	9	6	3	....	....	....	....	....	....	Dry and windy.
August	92.0	56.0	72.18	S. W.	10	5	7	1	....	2	....	....	....	Rains, from northeast.
September	86.0	40.0	63.62	S. W.	6	5	7	1	....	4	....	2	....	Moderately warm and dry.
October	84.0	30.0	61.58	S.	5	3	7	....	1	2	....	....	....	First half, cool and dry; latter, cool and windy.
November	76.0	16.0	44.26	N. W.	7	8	7	....	6	1	1	....	....	Dry and windy.
December	62.0	10.0	35.29	N. E.	7	10	14	....	4	8	2	....	....	Hazy; frequent mists.
1880.														
January	60.0	10.0	39.79	S. W.	12	10	18	....	2	9	....	....	4	A very humid month.
February	66.0	5.0	37.78	S. W.	4	5	11	....	5	2	....	....	6	First part, clear and cold; rest, hazy and warm.
March	72.0	18.0	38.68	N. W.	7	10	15	....	6	....	2	....	13	Very humid.
April	78.0	34.0	51.72	N. W.	11	7	12	2	2	....	....	....	....	Dry and windy.
May	92.0	40.0	69.40	S. W.	6	5	10	....	1	1	....	3	....	Warm and dry.
June	91.0	50.0	72 90	S. W.	10	6	5	1	....	....	....	....	....	Hot and dry.
For the year	79.6	30.7	58.79	....	94	80	111	5	27	24	5	5	23	

METEOROLOGIAL SUMMARY FOR 1879 AND 1880.

City Surveyor's Office, Paterson, New Jersey. Latitude, 40° 55′ N. Longitude, 74° 11′ W.

	Barometer. (Reduced to 32 degrees.)			Thermometer.			Mean Humidity.	Prevailing Winds.	Rain (inches).*	Snow (inches).	Days when Precipitation Equalled 0.01.	Cloudy Days.	Remarks.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1879.													
July				98.00°	61.0°	76.0°			5.18		11		Rainfall 1.18 above mean. During the month 1.50 in. fell in forty-five minutes.
August				92.00	58.0	71.0			7.89		9		Rainfall 3.16 above mean. Remarkably heavy rain storms—0.88 in fifteen minutes.
September				80.00	42.0	63.0			3.88		8		Rainfall 0.80 below mean. Heavy showers, ½ in. falling in five minutes.
October				80.00	28.0	60.0			0.32		5		Rainfall 3.50 below mean. The lowest record of rain in half a century.
November				70.00	17.0	40.0			1.15	3.50	7		Rainfall 2.76 below mean. The lowest record of rain in half a century.
December				60.00	11.0	34.0			5.55	7.25	11		Rainfall 1.64 above mean.
1880.													
January				62.00	11.0	36.0			2.90	3.00	9		Rainfall 0.40 below mean.
February				63.00	5.0	35.0			4.16	10.25	12		Rainfall 0.75 above mean.
March				62.00	19.0	37.0			6.73	14.00	14		Rainfall 3.00 above mean.
April				80.00	30.0	52.0			4.31		13		Rainfall 0.50 above mean.
May				95.00	30.0	72.0		S. W. and W.	0.85		8		Rainfall 3.66 below mean. The lightest record of rain since 1836.
June				97.00	59.0	76.0		S. W.	2.90		8		Rainfall 1.10 below mean.
For the year				78.25°	30.9°	54.3°			45.32	38.00	110		

* Including snow.

METEOROLOGY FOR VINELAND,

For Vital Statistic Comparison, from July 1st, 1879, to July 1st, 1880.

	BAROMETER.				TEMPERATURE, CLOUDS, &C.											WIND.								
	Maximum.	Minimum.	Mean.	Range.	Maximum.	Minimum.	Mean.	Range.	Dew Pt.	Humidity.	Degree of Cloudiness.	Clear Days.	Clear Observations.	Rain.	Rainy Days.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Total.
1879.																								
July	30.104	29.403	29.824	.701	97	46	75.27	51	65.33	73	5.74	2	30	3.04	7	4	9	3	6	12	47	1	11	93
August	30.052	29.530	29.788	.522	94	49	72.21	45	65.12	77	5.60	4	34	10.63	10	9	17	0	4	4	47	6	6	93
September	30.240	29.618	29.963	.622	91	38	65.53	53	62.55	75	5.44	2	36	3.35	7	11	8	0	13	8	20	4	26	90
Mean	30.132	29.517	29.858	.837	94	44.3	71.00	59	64.33	75	5.59	2.67	33.3	5.67	8	8	11⅓	1	7⅔	8	38	3⅔	14⅓	....
October	30.589	29.384	29.996	1.205	92	28	63.84	64	54.82	74	5.14	6	39	1.14	7	4	13	2	5	11	27	9	22	93
November	30.409	29.378	29.976	1.031	80	18	48.08	62	36.78	68	5.71	3	30	2.75	7	1	1	3	10	13	17	11	34	90
December	30.450	29.536	30.012	.914	70	12	41.68	58	32.49	72	7.66	0	16	6.28	12	11	18	5	6	2	23	9	19	93
Mean	30.483	29.433	29.995	1.050	80⅔	19⅓	51.20	80	41.36	71⅓	6.17	3	28.33	3.39	8.66	5⅓	10⅔	3⅓	7	8⅔	22⅓	9⅔	25	....
1880.																								
January	30.450	29.525	30.041	.925	61	10	41.28	51	21.29	68	7.04	1	21	3.75	6	5	9	1	1	2	33	14	28	93
February	30.392	29.014	29.923	1.378	69	12	39.05	57	21.26	71	6.35	4	24	2.88	6	5	8	1	7	4	17	8	34	84
March	30.306	29.141	29.864	1.162	74	20	40.91	54	34.43	82	6.25	2	30	3.36	10	8	4	1	8	8	29	4	31	93
Mean	30.383	29.228	29.943	1.436	68	14	40.42	64	25.66	74	6.55	2⅓	25	3.16	7.33	6	7	1	5⅓	4⅔	26⅓	8⅔	31	....
April	30.161	29.414	29.808	.750	82	22	53.06	60	42.55	80	6.35	3	27	3.47	9	9	4	3	8	8	18	7	33	90
May	30.048	29.608	29.871	.480	91	34	69.20	62	55.31	74	5.68	2	29	.77	4	6	8	4	15	5	39	0	16	93
June	30.112	29.527	29.842	.585	97	52	74.77	45	62.82	78	5.51	2	33	4.90	9	5	2	0	10	3	52	2	16	90
Mean	30.279	29.423	29.840	.850	90	36	65.68	75	53.56	77	5.85	2⅓	29⅔	3.05	7.33	6⅔	4⅔	2⅓	11	5⅓	36⅓	3	21⅔	....
Extremes for year	30.589	29.014	29.916	1.575	97	10	....	87	....	......	......	......	....	....	......	......	......	......	......	......	......	......	......	....
Sums	....	....	....	....	....	....	....	......	....	......	......	......	....	45.82	94	78	101	23	93	80	369	75	276	1,095
Mean for year	30.319	29.400	29.906	1.045	83.16	28.41	57.07	69.5	61.64	76	6.04	2.58	29.08	3.82	7.83	......	......	......	......	......	......	......	......	....

METEOROLOGY OF VINELAND, N. J.

For the Vital Statistic Comparison, from July 1st, 1878, to July 1st, 1879. Elevation above Sea Level, 105 feet. Latitude, 39° 38′.

	BAROMETER.				TEMPERATURE, CLOUDS, &C.											WIND.								
	Max.	Min.	Mean.	Range.	Max.	Min.	Mean.	Range.	Dew Pt.	Humidity.	Degree of Cloudiness.	Clear Days.	Clear Obs.	Rain.	Rainy Days.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Total.
1878.																								
July	29.989	29.488	29.786	.501	96°	66°	77.99°	30°	70.58	80	5.94	3	31	6.42	9	6	18	3	18	7	33	0	13	93
August........	30.020	29.501	29.780	.519	92	57	73.16	35	67.83	82	7.31	1	19	8.46	10	2	23	2	19	6	27	2	12	93
September........	30.294	29.520	29.985	.774	86	42	67.98	44	60.71	80	5.10	7	35	.69	5	10	21	2	11	6	27	0	13	90
Mean........	30.101	29.503	29.850	.598	91⅓	55	73.03	36	66.37	80.67	6.12	3.67	28.33	5.19	8	6	19	2⅓	16	6⅓	29	⅔	12 2-3	....
October........	30.125	29.016	29.887	1.109	78	32	56.24	46	48.32	76	5.24	5	34	2.18	7	6	6	1	9	5	28	11	27	93
November........	30.317	28.820	29.818	1.497	61	28	42.96	33	36.65	79	5.46	4	34	2.25	7	4	12	4	8	1	23	9	29	90
December........	30.313	28.656	29.834	1.657	60	9	31.76	51	22.18	67	5.57	4	30	5.69	9	0	2	2	7	1	30	5	46	93
Mean........	30.252	28.831	29.843	1.421	66⅓	21⅓	43.65	45	35.72	74	5.42	4.33	32.66	3.37	7.67	3⅓	6⅔	2⅓	8	2⅓	27	8⅓	34	....
1879.																								
January........	30.363	29.275	29.903	1.088	68	-4	28.92	67	27.95	86	5.70	7	34	5.01	13	5	9	1	1	2	33	14	28	93
February........	30.600	29.305	29.891	1.295	58	7	29.55	51	32.29	85	6.80	5	26	1.78	6	5	8	1	7	4	17	8	34	84
March........	30.514	29.294	29.964	1.220	68	18	41.01	50	42.15	87	5.30	4	35	3.89	9	8	4	1	8	8	29	4	31	93
Mean........	30.492	29.288	29.916	1.201	63	7	33.16	56	34.13	86	5.93	5.33	31.66	3.54	9.33	6	7	1	5 1-3	4⅔	26 1-3	8⅔	31	....
April........	30.238	29.758	29.755	.480	83	30	48.33	53	51.28	87	6.70	1	20	2.86	9	9	4	3	8	8	18	7	33	90
May........	30.288	29.666	29.908	.622	92	46	63.89	46	57.21	84	6.12	2	29	4.15	8	6	8	4	15	5	39	0	16	93
June........	30.091	29.858	29.831	.733	94	44	73.29	50	63.38	85	6.22	0	20	5.86	8	5	2	0	10	3	52	2	16	90
Mean........	30.206	29.594	29.831	.612	89⅔	40	61.67	53	57.29	85.33	6.35	1	23	3.96	8.33	6⅔	4⅔	2⅓	11	5⅓	36 1-3	3	21 2-3	....
Mean for year..	30.291*	29.304	29.860	.958	77.5	31	52.88	47.5	48.88	81.5	5.95	3.58	28.91	4.02	8.33	5½	9⅓	2	10 1-12	4⅔	28 5-6	6⅔	24 7-12	....
Sums........	....	....	....	....	......	......	....	....	....	....	......	44	347	48.24	100	66	112	24	121	54	341	80	295	1,095
Y'rly extremes.	30.600	28.656	29.985	1.944	96	-4	77.99	100	....	....	......	......	....	....	....	......	....	......	....	......	....	......	....	....

NOTE OF DR. INGRAM, OF VINELAND, ON THE SUMMARIES FOR THE THREE STATISTICAL YEARS ENDING JULY 1ST, 1881.

The summaries of these three years are rather expressive in the way of *contrast*. The year 1878–9 is near the average in temperature, pressure, &c., while 1879–80 is above the average temperature by 8 per cent., and over 13 per cent. above 1880–81.

These fluctuations in temperature bring with them conditions that seriously affect the public health, especially in the aged, as well as among the youths where there is much exposure, and to all classes not enjoying proper food and clothing.

The winter of 1880–81 will long be remembered as one of extraordinary severity. To give a clear idea of its exceptional severity, it may be stated that the average number of days in which *any* frost is found here is about 93 during a year, and of these 26 days are continuous frosty days, but during 1880–81 there were 128 frosty days and 51 days during which the temperature was below 32° for the entire day, and during the months of December, 1880, and January and February, 1881, the mean temperature was 27.16° with extremes of 58° and 10½°. No previous year in the past sixteen has given such results.

P. S.—Vineland is a center of most equable temperature, and hence the exceptional variations which have occurred here, point to still more marked contrasts elsewhere. It and the winter of 1880–81 help to explain the increased mortality of the year ending July 1st, 1881.

METEOROLOGICAL SUMMARY FROM JULY 1st, 1881, TO JANUARY 1st, 1882.

Station—Dennis Library, Newton, N. J. Latitude, 41° 2′ 45″ N. Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

MONTH.	BAROMETER. (Reduced to 32 degrees.)			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (Inches.)*	Days when Precipitation Equalled 0.01.	Cloudy Days.	Rain fell on Days.	Thunder and Lightning on Days.	Snow fell on Days.	Fog.	Hail.	Frost.	Lunar Halos.
	Max.	Min.	Mean.	Max.	Min.	Mean.												
1881.																		
July	29.544°	28.870°	29.208°	95.2°	57.8°	74.66°	67.88°	N. W. and S. W.	2.005	10	9	17	6	....	4	1	....	....
August	29.541	28.904	29.281	97.0	52.4	73.94	73.26	N. W. and S. W.	1.48	4	8	8	8	....	1	....	....	....
September	29.608	29.139	29.350	99.0	50.4	72.47	81.94	S. S. W.	2.20	11	11	11	7	....	7	....	....	....
October	29.810	28.735	29.378	84.9	31.2	55.94	84.30	S. W.	4.70	9	15	11	....	....	1	....	4	1
November	29.863	28.797	29.380	68 2	19.6	42 72	79.63	S. W.	3.23	12	12	12	....	5	4	....	2	3
December	29 805	28.552	29.352	63.0	17.0	39.09	76.80	S. W. and N. E.	4.76	14	17	14	1	4	6	2	9	6
For the half year	29.863°	28.552°	29.325°	99.0°	17.0°	59.80°	77.15	....	18.375	60	72	78	17	9	23	3	15	10

* Including melted snow.

REMARKS.—August, hazy; latter part of month, heavy dews. September, characterized by murky atmosphere, dense fogs; heavy dews, 16th and 23d, being like a Scotch mist, dripped from trees and was perceptible on dust of the road; rain on 1st was of reddish-brown color, with sooty taint; sunrise on 6th was accompanied by a yellowish-green fog covering everything and producing weird effects, three and a half hours. October, heavy dews and mists. November, fogs and mists. December, fogs, frosts, mists, lunar halos, drizzling rains, snow flurries (angle-worms and blue birds).

SUMMARY OF WEATHER

For 12 Months ending December 31st, 1881, Vineland, N. J.

	BAROMETER.					TEMPERATURE.				RAIN.			FROST.			WIND.										
	Maximum.	Minimum.	Range.	Mean.	Degree of Cloudiness.	Maximum.	Minimum.	Range.	Mean.	Hygrometer.	Rainy Days.	Rain.	Any Frost.	All Frost.	Thunder.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Total.	Clear Days.	Clear Observations.
January	30.489	29.158	1.331	29.998	70.1	46°	-10½°	56½°	25.31°	61	10	6.81	30	17	......	3	20	1	4	2	12	10	41	93	1	23
February	30.601	29.310	1.291	29.927	52.3	58	-6	64	29.96	61	9	5.61	23	9	......	9	18	1	18	4	8	10	26	84	5	37
March	30.072	28.880	1.192	29.549	70.7	62	22	40	28.86	76	8	5.28	15	2	1	3	10	5	6	3	15	16	35	93	2	21
April	30.070	29.307	.763	29.754	60.9	88	26	62	47.36	69	5	1.30	6	......	1	1	8	5	9	4	19	20	24	90	2	27
May	30.248	29.492	.756	29.879	60.2	94	44	50	64.24	72	10	3.50	......	......	5	2	20	5	21	6	31	2	6	93	4	32
June	29.978	29.518	.460	29.737	73.5	94	54	40	69.74	80	11	4.57	......	......	4	10	17	1	9	3	25	9	16	90	1	18
July	30.044	29.518	.526	29.779	65.3	97	60	37	77.89	68	6	2.96	......	......	6	5	15	2	9	4	30	9	19	93	0	23
August	30.168	29.540	.628	29.898	52.8	100	58	42	76.44	62	4	.65	......	......	2	15	12	0	11	4	32	8	11	93	2	34
September	30.164	29.708	.456	29.944	52.8	104	58	46	76.76	63	4	2.35	......	......	4	2	14	6	15	6	30	1	16	90	5	33
October	30.376	20.468	.908	30.028	59.0	92	30	62	61.72	61	8	3.13	1	......	1	10	10	1	7	4	38	7	16	93	5	33
November	30.541	29.594	.947	30.066	61.9	78	24	54	48.56	68	9	3.05	6	7	......	6	12	0	8	9	19	4	32	90	4	27
December	30.460	29.364	1.096	30.054	68.6	68	18	50	41.98	62	10	3.24	16	1	......	7	9	0	6	11	25	13	22	93	8	22
Mean	30.267	29.404	.863	29.884	62.3	81.75°	32.83°	48.92°	54.06°	67	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Sums	......	......	......	......	......	......	......	......	......	......	94	42.45	97	36	24	73	160	27	118	60	284	109	264	1,095	84	330

NOTES ON THE WEATHER BY MONTHS, IN 1881, AT VINELAND, N. J.

January.—Snow covered ground entire month; good sleighing; frost penetrated ground in exposed places 17½ inches—under the snow it thawed out; blackberry canes killed down to general surface of snow, 8 to 10 inches above ground; some pneumonia and bronchitis, yet not very fatal; barometer 30.041, and this .004 below average.

February.—Snow banks continued through the month; sleighing good to 9th; then considerable rain and changeable weather to 17th; then cold, and so continued to end of month, with some slight variations; total amount of rain and melted snow 5.61, and of this 12 inches of snow, or 1.2 inches of water are included; range of temperature 58—6=64°, and mean 29.96°; only five days thawing weather in month; barometer, maximum 30.601; minimum 29.310; range 1.291; mean 29.927, which is .035 below average; pneumonia and measles common, yet not fatal, the former quite depressing in the aged, and much care needed to bring them through; quinine very valuable, and in some cases stimulants needed.

March.—Month quite rough and stormy throughout; much rain, and this, with the snow of January and February, completely saturated the ground, flooding many cellars; roads very muddy; barometer quite low and variable, ranging from 30.072 to 29.880=1.192; mean 29.549, or a depression .367 below the average; some croup and bad colds.

April.—Quite variable and some rain, up to 18th; after this date vegetation bounded right along; it is quite clear that the blackberry canes were killed to 8 or 10 inches of ground, as the January observations seemed to indicate; raspberries safe, so far; some evergreens look as if scorched on north and northeast sides; latter part (from 19th) of month dry, and flooded cellars dried out; colds, croup, &c., among children; barometer 30.070—29.307=.763 range, and mean 29.754, showing a depression of .118 below the average; temperature ranged from 88° to 26°=62°, and mean 47.36°; last frost on 6th.

May.—Peaches a *failure*, many of the peach trees killed in many places, presumably by frost; apples, pears, wheat, rye, &c., look splendid; an excellent growing month; measles *very* common, and yet generally mild; barometer 30.248—29.492=.756 range; mean, 29.879, or .037 below the average.

June.—Numerous rainy days; very genial weather; healthy; barometer 29.978—29.518=.460 range; mean, 29.737, low.

July.—Up to *last day* of month the rainfall was *very* light, and temperature high, consequently vegetation suffered from drought; grass, corn, potatoes, &c., suffered much; raspberries and blackberries *excellent*, and brought fair prices; apples plenty, but no peaches.

Generally healthy; barometer, 30.044—29.518=.526 range; mean, 29.779; temperature, 96°—60°=36° range.

August.—Scorching dry and hot; only .65 inches rain or 4.55 below the average of August in 16 years; a little rain on 4 days; thunder on 2 days; ground dry as powder; temperature, 100°—58°=42° range; 76.44° mean; vegetation drying up; barometer, 30.168—29.540=.628 range; mean, 29.898.

September.—Good rain on 10th; very little either way before or since; crops look bad, very; high temperature and dry, thunder on 4 days; temperature, 104° maximum—58° minimum=46° range; 76.76° mean; barometer, 30.104 maximum—29.708 minimum=.456 range; 29.944 mean.

Average of Rain, in Inches, for 16 Years.		Rainy days.	For 1881.	Rainy days.
July	4.49	9	2.96	6
August	5.20	9	.65	4
September	4.40	7	2.35	4
Total	14.09	25	5.96	14

These figures for 1881 show powers that can scorch and blight.

October.—Evenly divided rains in month, but not enough to help vegetation to any great extent; *first* frost in season on 6th, and last on April 6th; intervening period, 183 days; round potatoes, nearly a failure; sweet potatoes, better in quantity and quality than anticipated; apple crop, splendid; some dysentery and bilious fever.

November.—Month moderate; no severe weather; wells low; water bad; temperature of wells, 54°; barometer, 30.541 maximum—29.592 minimum=.999 range; 30.066 mean; temperature, 78° maximum—24° minimum=54° range; 48.56° mean; diphtheria (sporadic cases), bilious fever.

December.—Month mild; towards end of month wells began to rise a little; temperature of water, 50°; robins disappeared about 20th; buds of maples and lilacs considerably swollen.

I can only express my regrets that I have been unable to give more details. I think another year may give more valuable materials, out of which to help form a basis of value to the sanitarian, meteorologist and others.

OBSERVATIONS TAKEN BY FRANK OSBORN, MIDDLETOWN, N. J.

From July 1st, 1880, to June 30th, 1881, inclusive. Maximum and Minimum Temperature.

1880. DAY OF MONTH.	JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	86°	64°	90°	60°	69°	59°	68°	41°	58°	34°	45°	24°
2	90	65	89	65	85	60	71	41	58	34	42	31
3	78	68	90	65	87	62	72	50	68	33	42	30
4	84	59	77	65	85	65	75	53	62	39	45	25
5	87	65	78	61	97	62	80	58	59	49	51	28
6	85	66	77	62	98	71	60	51	65	52	51	40
7	84	68	75	60	95	68	77	43	68	41	46	22
8	88	69	89	58	70	60	69	45	59	32	30	12
9	90	67	90	63	64	57	65	48	61	30	30	10
10	91	72	86	65	60	54	69	49	69	42	29	9
11	91	70	91	66	77	51	79	51	63	43	20	5
12	90	69	80	68	83	54	81	52	45	45	30	5
13	85	68	76	62	82	57	79	44	35	35	50	25
14	92	68	90	63	77	55	66	41	46	31	48	28
15	91	68	81	61	78	49	70	44	47	31	44	30
16	79	69	82	52	67	51	76	49	48	27	48	29
17	89	67	78	54	78	52	80	57	52	29	42	20
18	87	64	82	56	83	59	76	36	55	33	35	20
19	87	64	80	57	89	68	58	30	49	19	39	15
20	83	70	81	68	78	64	56	30	42	18	*	*
21	76	64	84	68	85	64	63	36	42	22	*	*
22	75	65	90	69	80	54	65	45	31	10	*	*
23	75	60	84	67	77	48	58	50	34	10	42	12
24	74	61	89	70	75	49	58	37	34	9	48	14
25	82	67	89	72	75	54	56	32	34	10	32	24
26	90	66	93	62	75	55	57	32	34	14	32	29
27	89	66	69	57	81	64	66	33	30	15	27	32
28	89	60	74	60	82	65	68	35	49	19	15	35
29	81	56	82	63	74	50	45	35	36	30	17	7
30	80	56	92	65	74	48	55	45	39	24	14	-11
31	85	60	66	58	....	....	62	54	....	....	6	-10

1881. DAY OF MONTH.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	16°	-3°	30°	10°	58°	30°	42°	30°	71°	38°	86°	64°
2	30	7	13	-6	32	18	41	29	59	44	78	59
3	35	10	17	-4	36	19	48	23	68	43	68	53
4	*	*	29	0	36	35	45	24	61	39	56	41
5	*	*	35	5	40	24	44	17	62	39	70	48
6	32	30	40	9	45	23	34	21	62	45	75	55
7	39	24	45	14	52	28	36	19	56	45	70	48
8	44	15	50	14	59	28	57	27	70	43	64	52
9	50	15	45	25	62	32	60	35	77	47	78	58
10	41	20	50	30	41	34	63	35	83	50	63	50
11	44	22	51	31	47	28	65	37	88	61	56	49
12	30	12	54	34	43	23	68	35	91	66	67	50
13	34	11	54	22	41	25	45	34	96	54	76	52
14	46	20	35	17	40	33	39	34	80	51	64	51
15	40	3	35	15	45	28	47	36	73	55	72	59
16	28	3	47	15	50	30	62	34	83	55	79	54
17	36	19	41	20	61	31	69	38	59	48	73	55
18	49	15	41	20	37	33	65	44	52	45	65	55
19	40	15	45	25	44	30	55	32	53	45	83	61
20	46	19	48	23	48	36	67	38	61	49	85	64
21	50	19	36	22	*	*	53	32	61	49	82	64
22	35	25	45	25	48	32	75	38	70	52	78	50
23	39	25	47	25	49	30	64	39	73	52	74	50
24	34	15	45	5	47	26	72	41	71	54	74	51
25	38	7	28	5	49	26	79	56	71	52	76	55
26	*	*	42	12	49	29	79	45	76	50	74	58
27	*	*	36	14	41	24	71	46	73	48	*	*
28	20	6	52	30	47	30	65	46	87	58	73	61
29	23	10	....	....	52	30	83	48	74	54	85	68
30	32	18	....	....	43	35	72	40	87	60	88	65
31	27	20	....	....	36	30	....	....	89	65	....	....

*No observations taken.

AGRICULTURAL FARM, NEW BRUNSWICK, N. J.

Latitude, 40° 29′. Longitude, 74° 26′. Height, 90 feet.

THEO. WEST, OBSERVER. [Copy from records of Prof. J. C. SMOCK, for 1881.]

	THERMOMETER.			Prevailing Winds.	Rain and Melted Snow (inches).
	Max.	Min.	Mean.		
January	45°	-7°	22.66°	N. N. W.	7 35
February	52	-1	26.69	W.	4 37
March	58	22	34.45	W. S. W.	4.51
April	75	21	43.36	W.	0.43
May	90	42	62.69	S. W.	2.53
June	88	50	64.68	N. N. E.	5.94
July	90	60	71.73	S. W.	0.00
August	99	60	72.12	W. S. W.	1.58
September	103	59	72.44	W. S. W.	0.50
October	89	35	58.55	W. S. W.	0.86
November	69	20	44 14	W.	2.05
December	61	19	39.83	W. S. W.	3.21
For the year	103	-7	51.11	...	33.33
Range	110	...	...	...	...

NOTE.—Barometer and Relative Humidity not measured.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS, BY TOWNSHIPS.

Atlantic County.

	M.	B.	D.
Absecon	5	17	15
Atlantic City	31	120	134
Buena Vista	4	22	12
Egg Harbor City	15	31	37
Egg Harbor Township	27	84	57
Galloway	......	35	23
Hamilton	10	44	18
Hammonton	20	36	34
Mullica	5	8	10
Weymouth	2	17	5
	119	414	345

Bergen County.

	M.	B.	D.
Englewood	20	63	44
Franklin	16	24	21
Harrington	10	31	27
Hohokus	30	47	41
Lodi	8	89	81
Midland	2	21	36
New Barbadoes	45	111	68
Palisade	13	26	20
Ridgefield	8	62	49
Ridgewood	11	31	27
Saddle River	4	30	19
Union	8	89	72
Washington	12	49	53
	187	673	558

Burlington County.

	M.	B.	D.
Bass River	....	24	17
Beverly	8	25	31
Bordentown	39	126	87
Burlington	47	142	132
Chester	34	64	36
Chesterfield	14	17	24
Cinnaminson	11	41	37
Delran	20	14	30
Evesham	7	27	20
Eastampton	....	12	14
Florence	6	41	19
Little Egg Harbor	21	51	15
Lumberton	4	35	32
Mansfield	15	33	21
Medford	9	25	26
Mt. Laurel	2	37	22
New Hanover	17	44	27
Northampton	48	91	83
Pemberton	18	56	62
Randolph	1	8	9
Shamong	4	17	14
Southampton	16	51	26
Springfield	3	39	26
Washington	1	17	5
Westampton	1	9	19
Willingboro	2	20	4
Woodland	....	6	4
	348	1,072	842

Camden County.

	M.	B.	D.
Camden City	399	639	954
Centre	4	36	18
Delaware	1	17	24
Gloucester	21	66	106
Gloucester City	32	129	108
Haddon	26	68	54
Stockton	25	61	92
Waterford	8	33	25
Winslow	5	43	35
	521	1,092	1,416

Cape May County.

	M.	B.	D.
Cape May City	21	42	21
Dennis	19	31	19
Lower	7	33	38
Middle	8	50	30
Upper	10	27	24
	65	183	132

Cumberland County.

	M.	B.	D.
Bridgeton	96	207	172
Commercial	7	14	20
Deerfield	2	26	17
Downe	17	26	13
Fairfield	30	78	60
Greenwich	6	21	21
Hopewell	4	27	27
Landis	58	124	92
Maurice River	6	33	33
Millville	82	262	174
Stoe Creek	10	21	13
	318	839	642

Essex County.

	M.	B.	D.
Belleville	10	61	61
Bloomfield	30	143	70
Caldwell	19	60	36
Clinton	16	51	35
East Orange	26	203	101
Franklin	8	21	20
Livingston	6	11	13
Millburn	13	31	24
Montclair	35	130	61
Newark	1,236	3,737	2,884
Orange	92	403	238
South Orange	10	98	53
West Orange	10	79	47
	1,511	5,028	3,643

Gloucester County.

	M.	B.	D.
Clayton	19	62	24
Deptford	7	34	18
East Greenwich	5	10	11
Franklin	8	66	44
Glassboro	26	61	29
Greenwich	16	46	52
Harrison	22	63	27
Logan	4	37	19
Mantua	11	41	31
Monroe	9	45	34
Washington	6	35	16
West Deptford	2	39	17
Woodbury	40	63	45
Woolwich	15	47	26
	190	649	393

Hudson County.

	M.	B.	D.
Bayonne	47	185	154
Guttenberg	6	27	22
Harrison	9	120	138
Hoboken	214	733	785
Jersey City	765	1,437	2,851
Kearney	1	30	25
North Bergen	6	47	229
Town of Union	47	148	110
Union	....	27	32
Weehawken	2	17	32
West Hoboken	24	119	105
	1,121	2,890	4,483

Hunterdon County.

	M.	B.	D.
Alexandria	4	21	13
Bethlehem	12	41	46
Clinton	7	45	9
Delaware	19	56	27
East Amwell	12	31	30
Franklin	17	21	9
Frenchtown	10	14	21
High Bridge	19	54	22
Holland	12	43	29
Kingwood	5	35	21
Lambertville	36	98	75
Lebanon	19	54	35
Raritan	18	68	52
Readington	25	73	47
Tewksbury	16	60	33
Town of Clinton	7	3	23
Union	7	14	24
West Amwell	3	24	13
	248	755	529

Mercer County.

	M.	B.	D.
Chambersburg	38	141	97
East Windsor	20	43	38
Ewing	3	16	44
Hamilton	21	62	51
Hopewell	27	57	44
Lawrence	9	59	55
Princeton	30	93	66
Trenton	323	586	565
Washington	1	10	22
West Windsor	15	25	17
	487	1,097	999

Middlesex County.

	M.	B.	D.
Cranbury	14	19	25
East Brunswick	16	75	50
Madison	4	21	26
Monroe	19	40	45
New Brunswick	142	430	323
North Brunswick	9	26	19
Perth Amboy	22	145	79
Piscataway	22	60	42
Raritan	21	60	51
Sayreville	5	16	21
South Amboy	19	87	69
South Brunswick	12	51	41
Woodbridge	8	63	59
	313	1,093	850

Monmouth County.

	M.	B.	D.
Atlantic	10	21	27
Eatontown	16	47	40
Freehold	47	68	72
Holmdel	9	22	17
Howell	25	90	49
Manalapan	9	31	23
Marlboro	6	26	37
Matawan	17	46	60
Middletown	34	67	76
Millstone	23	32	28
Neptune	45	100	91
Ocean	61	140	115
Raritan	37	105	62
Shrewsbury	52	179	88
Upper Freehold	28	70	47
Wall	34	124	53
	453	1,168	885

Morris County.

	M.	B.	D.
Boonton	36	49	50
Chatham	17	52	66
Chester	18	60	40
Hanover	15	46	80
Jefferson	5	37	27
Mendham	11	25	16
Montville	11	23	27
Morristown	37	115	109
Mount Olive	15	45	38
Passaic	8	10	33
Pequannock	10	52	39
Randolph	72	191	125
Rockaway	31	174	121
Roxbury	11	63	49
Washington	11	37	24
	308	979	844

Ocean County.

	M.	B.	D.
Berkeley	1	19	12
Brick	22	49	32
Dover	21	64	30
Eaglewood	4	8	10
Jackson	6	33	29
Lacey	13	16	6
Manchester	9	24	18
Ocean	1	14	4
Plumsted	6	48	26
Stafford	8	17	11
Union	3	31	20
	94	323	198

Passaic County.

	M.	B.	D.
Acquackanonk	....	36	22
Little Falls	17	26	29
Manchester	1	22	22
Passaic	66	208	129
Paterson	522	1,469	1,161
Pompton	34	31	27
Wayne	5	14	24
West Milford	24	55	36
	669	1,861	1,450

Salem County.

	M.	B.	D.
Elsinboro	....	5	2
Lower Alloways Creek	10	16	14
Lower Penn's Neck	8	20	14
Mannington	2	39	52
Oldmans	1	16	1
Pilesgrove	22	70	52
Pittsgrove	14	77	23
Quinton	4	41	13
Salem	38	97	74
Upper Alloways Creek	12	22	34
Upper Penn's Neck	28	51	46
Upper Pittsgrove	8	32	28
	147	486	353

Somerset County.

	M.	B.	D.
Bedminster	12	44	30
Bernards	23	52	36
Branchburg	10	22	16
Bridgewater	76	185	146
Franklin	17	51	55
Hillsborough	16	57	42
Montgomery	12	37	25
North Plainfield	5	56	39
Warren	10	9	16
	181	513	405

Sussex County.

	M.	B.	D.
Andover	14	21	17
Byram	12	29	23
Frankford	9	29	31
Greene	1	9	6
Hardyston	13	20	22
Hampton	3	4	7
Lafayette	9	5	14
Montague	3	8	10
Newton	21	25	30
Sandyston	10	21	19
Sparta	20	29	38
Stillwater	19	21	30
Vernon	7	28	24
Walpack	....	8	4
Wantage	14	38	45
	155	295	320

Union County.

	M.	B.	D.
Clark	2	7	8
Cranford	3	16	23
Elizabeth	223	707	564
Fanwood	4	18	14
Linden	8	35	29
New Providence	1	15	14
Plainfield	49	161	130
Rahway	48	114	104
Springfield	7	14	16
Summit	8	43	19
Union	9	39	26
Westfield	7	40	47
	369	1,209	994

Warren County.

	M.	B.	D.
Allamuchy	2	3	9
Belvidere	19	32	24
Blairstown	12	27	22
Franklin	26	21	21
Frelinghuysen	6	21	15
Greenwich	10	74	45
Hackettstown	33	48	34
Hardwick	....	11	2
Harmony	13	35	16
Hope	9	33	25
Independence	12	19	15
Knowlton	9	24	15
Lopatcong	5	51	22
Mansfield	18	22	30
Oxford	20	122	62
Pahaquarry	....	7	4
Phillipsburg	73	249	114
Town of Washington	36	19	36
Washington	2	47	20
	305	865	531

Totals of Marriages, Births and Deaths for all the Counties.

	M.	B.	D.
Atlantic	119	414	345
Bergen	187	673	558
Burlington	348	1,072	842
Camden	521	1,092	1,416
Cape May	65	183	132
Cumberland	318	839	642
Essex	1,511	5,028	3,643
Gloucester	190	649	393
Hudson	1,121	2,890	4,483
Hunterdon	248	755	529
Mercer	487	1,097	999
Middlesex	313	1,093	850
Monmouth	453	1,168	885
Morris	308	979	844
Ocean	94	323	198
Passaic	669	1,861	1,450
Salem	147	486	353
Somerset	181	513	405
Sussex	155	295	320
Union	369	1,209	994
Warren	305	865	531
Total for the State	8,109	23,484	20,812

The total number of still births for the State during the year was 1,476

And of reburials, transit permits, &c. 481

SUMMARY OF TOTALS FOR WHOLE STATE FOR THE PAST THREE YEARS.

	M.	B.	D.
1879	7.096	23,116	20,440
1880	7,936	23 680	18,967
1881	8,109	23,484	20,812

Return of Deaths from all Causes and Certain Specified Diseases, in the Counties of the State of New Jersey, for the Year ending July 1st, 1881.

Counties of New Jersey.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Atlantic	67	50	27	96	102	3	345	18,704	18.44
Bergen	107	62	54	178	148	9	558	36,786	18 37
Burlington	178	102	75	244	230	13	842	55,403	15.19
Camden	320	218	175	404	268	31	1,416	62,942	22.49
Cape May	30	10	8	33	45	6	132	9,765	13.51
Cumberland	142	109	70	159	157	5	642	37,687	17.03
Essex	816	539	306	1,277	702	13	3,653	189,929	19.23
Gloucester	96	36	40	109	98	3	382	25,886	14 75
Hudson	1,103	824	484	1,476	571	25	4,483	187,944	23 85
Hunterdon	79	45	52	147	204	2	529	38,570	13 71
Mercer	191	125	77	332	246	28	999	58,061	17.29
Middlesex	181	90	82	273	219	5	850	52 286	16.25
Monmouth	209	115	68	224	264	5	885	55,538	15.93
Morris	156	100	71	261	245	11	844	50,861	16 59
Ocean	34	22	22	51	67	2	198	14,455	13.69
Passaic	366	233	126	457	263	5	1,456	68,860	21.05
Salem	87	45	40	78	101	1	352	24,579	14.32
Somerset	78	32	46	132	113	4	405	27,162	14.91
Sussex	49	38	32	110	90	1	320	23,539	13.59
Union	280	135	93	319	216	1	994	55,571	17.88
Warren	110	58	68	155	138	2	531	36,589	14.51
Total	4,639	2,968	2,016	6,515	4,487	175	20,810	1,131,117	18.39

Counties of New Jersey.	Principal causes of death. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Dige-tive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Total deaths from these diseases.	Death rate per 1,000 from these diseases.
Atlantic	2	9	9	10	......	3	9	39	41	29	27	18	15	38	2	33	5	1	3	......	......
Bergen	24	10	......	8	1	6	24	44	80	62	43	36	17	41	5	33	15	2	10	......	......
Burlington	9	30	9	18	9	12	27	97	116	65	48	60	22	83	7	60	11	7	16	......	......
Camden	14	79	144	76	7	10	30	136	180	105	94	70	21	88	6	58	24	3	22	......	......
Cape May	2	11	......	......	......	5	5	18	9	11	5	7	2	13	......	13	9	......	3	......	......
Cumberland	4	24	1	23	16	14	36	76	91	64	48	47	24	41	3	32	7	1	3	......	......
Essex	79	75	6	56	2	11	278	396	585	485	318	219	130	257	25	166	78	9	66	......	......
Gloucester	6	11	4	11	1	1	11	61	61	22	29	26	4	31	3	24	9	1	3	......	......
Hudson	72	119	70	130	8	12	325	545	587	478	513	230	111	221	17	147	84	20	58	......	......
Hunterdon	18	17	......	9	......	4	29	31	71	41	20	42	15	71	5	41	15	4	12	......	......
Mercer	17	36	2	34	2	7	27	85	171	93	65	57	32	87	5	59	41	7	15	......	......
Middlesex	28	18	1	17	1	7	38	100	125	81	38	52	33	56	3	58	24	4	13	......	......
Monmouth	12	26	1	16	3	1	25	145	109	71	52	68	26	86	1	73	22	2	10	......	......
Morris	38	14	......	21	......	1	33	69	107	119	51	53	27	99	6	46	19	5	16	......	......
Ocean	2	4	......	7	......	......	10	22	34	12	6	13	3	17	2	21	5	......	4	......	......
Passaic	40	32	......	15	12	9	90	177	235	174	117	75	57	70	7	59	25	4	16	......	......
Salem	6	9	2	6	3	4	12	39	49	45	22	21	10	25	4	21	10	2	2	......	......
Somerset	15	6	3	7	......	3	26	42	70	41	6	24	10	38	2	30	8	7	9	......	......
Sussex	12	7	......	4	......	3	10	29	44	33	22	25	8	34	2	11	10	2	7	......	......
Union	24	17	2	24	2	6	43	104	151	120	90	42	25	66	11	53	21	4	7	......	......
Warren	7	20	......	7	3	......	40	50	73	57	28	28	16	40	8	39	9	4	8	......	......
Total	431	574	264	499	70	119	1128	2256	2969	2208	1612	1213	608	1502	124	1060	451	89	303	17,539	15.50

Return of Deaths from all Causes and Certain Specified Diseases, in the Cities of the State of New Jersey, of Over 5,000, for the Year Ending July 1st, 1881.

STATISTICAL DIVISIONS.	DEATHS AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																				
Incorporated Cities of the State having by the Census of 1880 over 5,000.	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1875.	Death rate per 1,000.	Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Total deaths from these diseases.	Death rate per 1,000 from these diseases.
Atlantic County.																														
Atlantic City	33	23	15	37	25	1	131	5,477	24.46	......	4	......	10	...	3	4	17	9	10	11	7	7	16	...	12	2	1	1	....	....
Burlington County.																														
Bordentown	15	5	8	33	26	...	87	5,334	16.31	2	2	......	3	1	...	......	6	13	5	5	5	3	13	2	5	3	...	3	....	....
Burlington	25	16	13	50	28	1	133	7,237	18.37	4	2	1	......	1	5	.....	12	25	11	10	11	5	13	4	9	1	1	3	....	....
Camden County.																														
Camden	222	163	132	271	157	9	954	41,659	22.90	6	32	134	58	3	6	20	93	125	70	61	41	15	47	4	34	18	2	13	....	....
Gloucester City	31	11	11	35	20	...	108	5,347	20 19	3	6	......	3	4	...	3	6	17	11	11	2	1	9	...	6	1	1	3	....	....
Cumberland County.																														
Bridgeton	36	29	15	48	41	3	172	8,722	19.72	1	5	......	6	...	3	23	23	21	11	10	17	5	9	...	12	3	1	......	....	....
Millville	49	43	26	32	23	1	174	7,660	22.71	......	5	......	13	14	7	10	22	23	26	11	8	5	3	...	6	2	...	......	....	....
Essex County.																														
East Orange	22	13	13	34	29	...	111	8,349	13.29	......	4	......	3	1	...	11	9	22	15	6	12	5	5	1	2	3	...	3	....	....
Newark	654	440	247	1,035	498	10	2,884	136,508	21.12	65	51	4	42	2	4	231	306	453	346	246	169	92	188	20	137	61	8	45	....	....
Orange	58	35	19	83	43	...	238	13,207	18.02	1	7	......	4	...	2	14	20	33	44	20	13	7	14	1	5	4	...	5	....	....
Hudson County.																														
Bayonne	44	24	16	45	25	...	154	9,372	16.43	2	......	......	1	...	...	8	16	17	14	30	10	5	3	2	5	......	...	2	....	....
Harrison	37	29	15	42	14	1	138	6,898	20 00	2	8	......	2	...	...	7	20	19	17	23	4	3	4	...	2	4	...	2	....	....
Hoboken	212	166	70	256	81	...	785	30,999	25.32	8	17	9	36	2	1	73	105	93	74	93	32	16	39	4	26	14	10	10	....	....
Jersey City	688	523	322	953	348	17	2,851	120,722	23.61	42	79	43	84	5	10	208	326	390	320	326	151	69	140	7	90	56	9	40	....	....
Town of Union	31	19	7	42	11	...	110	5,849	18.80	2	4	......	1	...	...	14	11	21	6	12	7	3	4	1	5	1	...	2	....	....
West Hoboken	23	23	15	29	15	...	105	5,441	19.29	1	1	......	......	1	...	5	25	10	17	11	9	5	4	...	2	1	...	......	....	....
Mercer County.																														
Chambersburg	21	20	11	27	15	3	97	5,437	17.84	3	3	......	8	2	1	3	11	17	4	4	4	3	3	...	8	4	1	4	....	....
Trenton	117	79	36	191	127	15	565	29,910	18.89	10	19	......	20	...	4	16	48	101	56	46	26	20	40	3	30	17	4	8	....	....
Middlesex County.																														
New Brunswick	78	46	36	94	67	2	323	17,166	18.81	5	10	......	14	1	4	14	44	48	31	16	22	16	23	2	11	8	1	4	....	....
Morris County.																														
Morristown	14	8	5	44	37	1	109	6.837	15.94	2	1	......	1	...	...	5	9	16	7	6	8	7	34	...	4	......	...	1	....	....
Passaic County.																														
Passaic City	48	19	9	40	13	...	129	6.532	19 44	......	......	......	4	1	2	3	20	21	16	12	7	9	6	...	2	1	1	2	....	....
Paterson	287	194	100	378	198	4	1,161	51,031	22.75	24	29	......	11	9	4	83	140	197	144	95	55	41	48	6	50	20	2	12	....	....
Salem County.																														
Salem	17	10	2	20	25	...	74	5,056	14.63	......	2	......	......	...	1	1	5	14	16	1	5	1	6	...	8	1	2	......	....	....
Union County.																														
Elizabeth	140	74	56	193	101	...	564	28,229	19.97	7	8	1	7	2	5	19	59	95	77	58	23	10	32	2	30	11	3	5	....	....
Plainfield	34	22	7	32	35	...	130	8,125	16.00	1	3	1	2	...	1	8	18	24	12	10	5	7	5	2	8	......	1	......	....	....
Rahway	14	11	7	44	28	...	104	6,455	16.11	3	1	......	6	...	..	......	8	11	15	6	6	4	15	3	6	4	...	1	....	....
Warren County.																														
Phillipsburg	34	12	14	35	19	...	114	7,181	15.87	2	7	......	1	...	...	6	9	15	18	6	5	2	6	...	5	1	1	5	....	....
Total	2,984	2,057	1,227	4,123	2,049	68	12,508	590.740	21.17	196	310	193	340	49	63	789	1,388	1,845	1,393	1,146	664	366	729	64	520	241	49	174	10,519	17.80

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

ATLANTIC COUNTY. Population ......18,704. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Absecon	3	1		2	9		15	507										3	1	2	2	1			2				
Atlantic City	33	23	15	37	25	1	134	5,477	24.46		4		10		3	4	17	9	10	11	7	7	16		12	2	1	1	10
Buena Vista	3			4	4	1	12	885										3	2	2			1		2			1	
Egg Harbor City	7	3	3	15	9		37	1,232				8				1	5	6	4	3			1		3	1			
Egg Harbor Township (excluding Absecon)	5	14	4	14	19	1	57	3,568			2					1	9	11	6	4	4	3	6	2	5	1			
Galloway, (excluding Egg Harbor City)	5	2	1	5	10		23	2,337		1		1				1		1	1	2	2	1	4		2	1		1	
Hamilton	3	3	1	4	7		18	1,464		1	2					1	2	1	2				2		1				1
Hammonton	7	2	3	11	11		34	1,776								1	5	4	1	3	1	3	6		4				
Mullica		1		4	5		10	717			1							3	2				1		2				
Weymouth	1	1			3		5	741									1				2		1						
Total	67	50	27	96	102	3	345			2	9	9	10		3	9	39	41	29	27	18	15	38	2	33	5	1	3	11
Death rate per 1,000 for county									18.44																				
Death rate per 1,000 for county, exclud'g city									15.95																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

BERGEN COUNTY.

Population 36,786

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Englewood	16	1	1	12	13	1	44	4,076	......
Franklin	3	1	1	6	8	2	21	2,2[illegible]	......
Harrington	3	2	4	8	10	......	27	2,570	......
Hohokus	6	2	6	13	12	2	41	2,92[illegible]	......
Lodi	23	11	7	23	17	......	81	4,071	......
Midland	4	4	2	12	13	1	36	1,591	......
New Barbadoes	13	10	4	26	15	......	68	4,248	......
Palisade	5	2	2	5	6	......	20	2,302	......
Ridgefield	11	5	1	18	14	......	49	3,932	......
Ridgewood	4	3	5	10	5	......	27	1,478	......
Saddle River	2	......	5	10	2	......	19	1,355	......
Union	12	12	8	23	14	3	72	3,164	......
Washington	5	9	8	12	19	......	53	2,853	......
Total	107	62	54	178	148	9	558	......	......
Death rate, per 1,000, of county	......	......	......	......	......	......	......	......	18.37

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diptheria.	Diarrhœal diseases.	Consumption.
Englewood	2	......	......	......	......	2	2	5	3
Franklin	......	1	......	......	......	......	......	1	2
Harrington	3	......	......	2	......	......	......	4	3
Hohokus	1	1	......	......	......	......	......	7	10
Lodi	4	......	......	......	......	......	6	11	11
Midland	5	......	......	......	1	......	1	......	4
New Barbadoes	......	1	......	......	......	2	5	1	15
Palisade	1	......	......	......	......	......	2	1	5
Ridgefield	1	......	......	......	......	......	2	4	10
Ridgewood	1	1	......	2	......	......	1	1	......
Saddle River	2	......	......	......	......	......	......	......	3
Union	3	5	......	1	......	2	2	4	3
Washington	1	1	......	3	......	......	3	5	11
Total	24	10	......	8	1	6	24	44	80
Death rate, per 1,000, of county	......	......	......	......	......	......	......	......	......

Statistical Divisions.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Englewood	6	1	7	......	2	......	1	3	......	2	1
Franklin	2	2	2	......	1	......	2	1	......	......	2
Harrington	5	......	1	......	4	......	2	......	......	1	3
Hohokus	1	1	3	......	5	......	5	1	1	1	1
Lodi	7	12	5	......	3	1	7	......	......	1	2
Midland	3	......	2	2	5	......	2	1	......	......	3
New Barbadoes	7	8	3	3	7	2	2	1	......	1	1
Palisade	1	1	1	2	......	......	1	......	......	......	2
Ridgefield	7	1	2	......	6	1	5	1	......	......	2
Ridgewood	3	3	2	4	2	......	......	2	......	......	......
Saddle River	6	1	1	......	......	1	1	2	......	......	......
Union	13	6	3	5	4	......	4	2	......	2	6
Washington	1	7	4	1	2	......	1	1	1	2	2
Total	62	43	36	17	41	5	33	15	2	10	......
Death rate, per 1,000, of county	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

BURLINGTON COUNTY.

Population.......55,463

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and Spinal diseases.	Erysipelas.	Digestion and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bass River	5	1		4	7		17	1,006						1			3	1	1	1	1	1	2		1		1	1	
Beverly (city)	6	4	2	5	6		23	1,759			2					1	4	5	3	3	3	1						1	1
Beverly Township (exclusive of city)	2	1		3	2		8	1,369									2			1	2		2			1			1
Bordentown (including township)	15	5	8	33	26		87	5,334	16.31	2	2		3	1			6	13	5	5	5	3	13	2	5	3		3	4
Burlington (including township)	25	16	13	50	28		132	7,237	18.37	4	2	1		1	5		12	25	11	10	11	5	13	4	9	1	1	3	4
Chester	4	6	1	8	17		36	2,855			1						2	2	5	4	8	2	4		1		1	2	1
Chesterfield	5	1		6	12		24	1,525			1	2			1	1	2	2	2		2		6		3				
Cinnaminson	8	5	4	13	7		37	2,184					4	1		1	5	3	2	2	3		4		5	1		1	1
Delran	8	3	5	12		2	30	1,760			4						3	3	4	3	1				4			1	2
Evesham	6	3	1	5	5		20	1,602			1				1	1		2	4		1		3				1		1
Eastampton	2	3		3	6		14	566					1			2	1		1		1				1				1
Florence	6	2	1	4	6		19	1,528								1	5	3	3		2		1		1			1	
Little Egg Harbor	3	2	2	6	1	1	15	1,881									3	6							2				1
Lumberton	4	8	4	3	12	1	32	1,689			2		2			7	2	3	1	2	3		3		3				
Mansfield	4	4	2	4	7		21	1,648			3	2					2		1	1	3	1	1						
Medford	8	2	2	8	6		26	1,980			1						5	6	2	1	1		3					1	
Mount Laurel	5	6	4	3	4		22	1,739		1					2	3	3	1	3		2		2		1				3
New Hanover	6	2	2	6	11		27	2,373			2					1	2	4	2	1	1	2	3		2	1			
Nortampton	22	4	9	24	23	1	83	4,630		1	3		1	2	2	1	18	12	3	7	5	3	7		3	1	1		1
Pemberton	13	5	6	18	18	2	62	2,885		1	2	4	2	1		1	6	9	1	3	2	3	9		2	2	1	1	2
Randolph		2	1	3	3		9	428										3		2	1				2		1		
Shamong	2	4	3	1	2	2	14	1,097					2	2	1		1	1	3		1			1					
Soutampton	5	3		7	9	2	26	2,269									2	5	1	1	1		1		9	1			
Springfield	5	3	8	7	8		26	1,886			3		2			2	2	1	4	1			4		4			1	
Washington	3			2			5	389									1		2				1						
Westampton	8	5	1	6	3	1	19	715			1		1			2	3	6	1			1			1				
Willingboro		1				1	4	743								4							1		1				
Woodland	2	1	1				4	325								2	2												
Total	178	102	75	244	230	13	842			9	30	9	18	9	12	27	97	116	65	48	60	22	83	7	60	11	7	16	
Death rate per 1,000 of county									15.19																				
Death rate per 1,000 of county, exclusive of cities									14.54																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

CAMDEN COUNTY. Population ......62,942 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Camden City	222	163	132	271	157	9	954	41,659	22.90	6	32	134	58	3	6	20	93	125	70	61	41	15	47	4	34	18	2	13	
Centre	9	3		4	2		18	1,538									5	2	1		2		1						
Delaware	7	1	1	8	7		24	1,481			3					1	4	5	1	3	1		1	1	1	1			
Gloucester Township	7	7	6	36	30	20	106	2,527		1	36		4			3	6	8	6	4	6		12		11	2		1	1
Gloucester City	31	11	11	35	20		108	5,347	20.19	3	6		3	4		3	6	17	11	11	2	1	9		6	1	1	3	1
Haddon	17	4	7	8	18		54	2,551		2	2	1	3		3	1	6	5	5	4	6	2	4	1					1
Stockton	21	24	9	24	13	1	92	3,532		1		6	1		1	1	12	12	6	10	9		4		3	2		4	4
Waterford	3		4	7	10	1	25	2,149		1			2				3	3	2		1		5		2				3
Winslow	3	5	5	11	11		35	2,158				3	5			1	1	3	3	1	2	3	5		1			1	
Total	320	218	175	404	268	31	1416			14	79	144	76	7	10	30	136	180	105	94	70	21	88	6	58	24	3	22	
Death rate, per 1,000, of county									22.49																				
Death rate per 1,000 of county, excl'd'g cities									22.21																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

CAPE MAY COUNTY.	DEATHS AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																			
Population ....9,765 Statistical Divisions.	Under one.	One to five.	Five to ten.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cape May City	6	2	1	5	5	2	21	1,699	......	......	1	......	......	......	......	2	3	2	1	......	3	2	3	......	3	......	......	......	1
Dennis	3	......	3	5	8	......	19	1,812	......	......	3	......	......	......	1	......	......	......	1	......	1	......	2	......	3	3	......	2	......
Lower	12	5	......	7	13	1	38	1,977	......	1	3	......	......	......	4	2	6	3	4	1	......	......	4	......	3	......	......	......	......
Middle	6	3	3	5	11	2	30	2,575	......	......	1	......	......	......	......	1	5	3	3	3	1	......	2	......	2	1	......	1	1
Upper	3	......	1	11	8	1	24	1,702	......	1	3	......	......	......	......	......	4	1	2	1	2	......	2	......	2	5	......	......	......
Cape May Point*	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total	30	10	8	33	45	6	132	......	......	2	11	......	......	......	5	5	18	9	11	5	7	2	13	......	13	9	......	3	......
Death rate, per 1,000, of county	......	......	......	......	......	......	......	......	13.51	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

* Its population of 198 is included in Lower Township.

Return of Deaths from all Causes and Certain Specified Causes, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

CUMBERLAND COUNTY. Population ....37,687 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bridgeton	36	29	15	48	41	3	172	8,722	19.72	1	5		6		3	23	23	21	11	10	17	5	9		12	3	1		
Commercial	5	5	1	6	3		20	2,265			1				1	1	3	3		2	3	1	1						1
Deerfield	3		2	5	7		17	1,643			2		1				2	2			1	1	4					1	3
Downe	1	2	1	4	5		13	1,687									1	1	2	1	2		2		1	1			1
Fairfield	9	6	6	17	21	1	60	3,215			4		1		2	1	8	11	5	2	8	1	5	1	2			1	2
Greenwich	3	4	1	8	5		21	1,245			1						2	5		1	1	2	1		1				1
Hopewell	5	4	2	5	11		27	1,764			1		1		1		2	1	2	3	2	4	5		1				2
Landis	22	10	10	26	24		92	6,005		3	2	1	1	1			7	22	13	13	3	3	8	2	3	1		1	
Maurice River	7	6	6	4	10		33	2,374			2			1		1	6	2	5	5			1		4				2
Millville	49	43	26	32	23	1	174	7,660	22.71		5		13	14	7	10	22	23	26	11	8	5	3		6	2			3
Stoe Creek	2			4	7		13	1,107			1										2	2	2		2				
Total	142	109	70	159	157	5	642			4	24	1	23	16	14	36	76	91	64	48	47	24	41	3	32	7	1	3	
Death rate per 1,000 of county									17.03																				
Death rate per 1,000 of county, excl'd'g cities									13.89																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

ESSEX COUNTY. Population.........189,929	DEATHS AT ALL AGES.									PRINCIPAL CAUSES OF DEATH.																			
Statistical Divisions.	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.	Accident.
Belleville	13	13	2	14	16	3	61	3,004	....	3	......	1	1	......	......	7	9	9	7	5	1	4	7	......	2	1	......	......	1
Bloomfield	16	6	5	17	26	......	70	5,748	....	1	1	......	......	......	......	1	17	12	10	2	5	5	6	......	1	2	......	2	1
Caldwell	4	4	......	9	19	......	36	3,167	....	......	......	......	......	......	......	2	3	4	7	1	2	3	4	......	5	1	......	1	1
Clinton	6	2	......	14	13	......	35	2,742	....	......	2	......	......	......	......	......	2	5	2	2	3	3	5	1	3	......	......	2	2
East Orange	22	13	13	34	29	......	111	8,319	13.29	1	7	......	4	......	2	14	20	33	44	20	13	7	14	1	5	4	......	5	......
Franklin	3	3	1	5	8	......	20	1,617	....	......	......	......	......	......	......	......	2	5	3	3	1	1	3	......	......	......	......	......	1
Livingston	1	1	......	5	6	......	13	1,401	....	......	......	......	......	......	......	......	1	4	1	1	3	1	......	......	......	2	......	......	......
Millburn	2	1	3	12	6	......	24	1,743	....	6	......	......	1	......	......	......	2	7	1	......	1	......	1	......	2	......	......	2	......
Montclair	13	10	8	20	10	......	61	5,147	....	......	4	......	......	......	3	6	4	10	6	5	5	1	4	1	2	1	......	3	......
Newark	654	440	247	1,035	498	10	2,884	136,508	21 12	65	51	4	42	2	4	231	306	453	346	246	169	92	188	20	137	61	8	45	......
Orange	58	35	19	83	43	......	238	13,207	18.02	1	7	......	4	......	2	14	20	33	44	20	13	7	14	1	5	4	......	5	......
South Orange	8	8	8	15	14	......	53	3,911	....	2	2	1	4	......	......	3	5	10	7	5	1	2	4	1	1	2	......	......	1
West Orange	16	3	......	14	14	......	47	3,385	....	......	1	......	......	......	......	......	5	......	7	8	2	4	7	......	3	......	1	1	1
Total	816	539	306	1,277	702	13	3,653	....	....	79	75	6	56	2	11	278	396	585	485	318	219	130	257	25	166	78	9	66	......
Death rate per 1,000 of county	......	......	......	......	......	......	......	....	19.23	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1,000 of county, exclusive of cities	......	......	......	......	......	......	......	....	13.18	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Division of the State of New Jersey, for the Year ending July 1st, 1881.

GLOUCESTER COUNTY.

Population 25,886

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Clayton	8	3	1	7	5	......	24	1,981	......
Deptford	6	1	1	4	6	......	18	1,520	......
Franklin	8	8	7	10	11	......	44	2,480	......
Glassboro	7	7	3	7	5	......	29	2,088	......
Greenwich	12	3	6	14	16	1	52	2,598	......
Harrison	7	1	......	8	11	......	27	2,841	......
Logan	5	1	2	6	5	......	19	1,765	......
Mantua	6	2	2	14	7	......	31	1,718	......
Monroe	8	4	8	9	4	1	34	1,858	......
Washington	3	2	2	5	4	......	16	1,366	......
West Deptford	4	1	1	9	1	1	17	1,399	......
Woodbury	18	2	3	9	13	......	45	2,298	......
Woolwich	4	1	4	7	10	......	26	1,974	......
Total	96	36	40	109	98	3	382	......	......
Death rate per 1,000, of county	......	......	......	......	......	......	......	......	14.75

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clayton	......	......	......	......	......	......	1	5	3	1	2	......	1	5	......	......	2	......	......	1
Deptford	......	1	......	......	......	......	......	3	1	......	3	3	......	2	......	2	......	......	......	2
Franklin	1	1	......	1	......	......	3	6	6	5	5	......	......	2	......	4	......	......	1	2
Glassboro	......	1	......	......	......	......	2	7	6	3	2	......	1	2	......	1	......	......	......	1
Greenwich	......	1	1	......	......	......	......	9	7	5	5	2	1	6	1	1	3	......	......	3
Harrison	2	......	......	......	......	1	1	2	5	1	2	3	......	2	......	2	2	1	......	......
Logan	......	......	......	3	......	......	......	4	4	......	1	2	1	......	......	2	......	......	......	......
Mantua	......	1	2	......	......	......	1	5	5	2	......	3	......	3	1	3	......	......	......	3
Monroe	1	......	......	5	1	......	1	4	10	3	2	......	......	1	......	......	......	......	......	1
Washington	......	2	......	2	......	......	......	1	1	......	3	3	......	1	......	1	1	......	1	......
West Deptford	......	2	......	......	......	......	1	1	1	......	1	1	......	1	......	3	......	......	......	1
Woodbury	......	......	1	......	......	......	1	11	7	1	3	3	......	5	1	1	1	......	1	1
Woolwich	2	2	......	......	......	......	......	3	5	1	......	6	......	1	......	4	......	......	......	1
Total	6	11	4	11	1	1	11	61	61	22	29	26	4	31	3	24	9	1	3	......
Death rate per 1,000, of county	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

HUDSON COUNTY. Population.........187,944 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Bayonne	44	24	16	45	25	......	154	9,372	16.43
Guttenberg	5	3	1	8	5	......	22	1,206	....
Harrison	37	29	15	42	14	1	138	6,898	20 00
Hoboken	212	166	70	256	81	......	785	30,999	25.32
Jersey City	688	523	322	953	348	17	2,851	120,722	23.61
Kearney	5	1	7	7	5	......	25	777	....
North Bergen	44	19	25	77	57	7	229	4,268	53.66
Town of Union	31	19	7	42	11	......	110	5,849	18.80
Union Township	6	9	3	9	5	......	32	1,310	....
Weehawken	8	8	3	8	5	......	32	1,102	....
West Hoboken	23	23	15	29	15	......	105	5,441	19 29
Total	1,103	834	484	1,476	571	25	4,483	....	....
Death rate per 1,000 of county	......	......	......	......	......	......	......	....	23.85
Death ate per 1,000 of county, exclusive of cities	......	......	......	......	......	......	......	....	39.13

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal Diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bayonne	2	......	......	1	......	......	8	16	17	14	30	10	5	3	2	5	......	......	2	......
Guttenberg	1	......	......	1	......	......	......	5	......	1	1	1	1	3	1	1	1	......	......	3
Harrison	2	8	......	2	......	......	7	20	19	17	23	4	3	4	......	2	4	......	2	......
Hoboken	8	17	9	26	2	1	73	105	93	74	93	32	16	89	4	26	14	10	10	......
Jersey City	42	79	43	84	5	10	208	326	390	320	326	151	69	140	7	90	56	9	40	......
Kearney	2	2	......	1	......	......	......	1	2	1	4	......	1	3	......	3	......	1	......	1
North Bergen	10	5	18	2	......	1	4	23	30	27	7	11	6	17	1	11	6	......	8	14
Town of Union	2	4	......	1	......	......	14	11	21	6	12	7	3	4	1	5	1	......	1	......
Union Township	1	2	......	1	......	......	5	6	3	......	2	2	1	2	......	1	1	......	......	1
Weehawken	1	1	......	1	......	......	1	7	2	1	4	3	1	2	1	1	......	......	......	2
West Hoboken	1	1	......	......	1	......	5	25	10	17	11	9	5	4	......	2	1	......	......	......
Total	72	119	70	130	8	12	325	545	587	478	513	230	111	221	17	147	84	20	58	......
Death rate per 1,000 of county	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death ate per 1,000 of county, exclusive of cities	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

NOTE—The excess of North Bergen is chiefly owing to the fact that some of the alms institutions of Hudson county are located there.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

HUNTERDON COUNTY.

Population.. 38,570

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alexandria	1	1	1	3	7		13	1,324		1						2	1	1	3				1		2				
Bethlehem	5	5	9	13	13	1	46	2,830		1	3		1		1	2	5	3	4	3	3	1	8		3	1		2	1
Clinton Township (including Town of Clinton, below)		2		4	3		9	2,133					1					1	1				2		3				
Delaware	3	1	2	7	14		27	3,092		2					1		1	2	1		3	1	5		4	1		1	1
East Amwell	1	3	1	11	14		30	1,696		2			1					4	3	1	3	1	7		2	1	1		
Franklin		1	1	2	5		9	1,338			1					1		2	1				2		2				
Frenchtown	2			5	14		21	1,039		4					1			3	1		2		6	1	1				
High Bridge	4	1	2	8	7		22	2,209		2	1					1				1	4	1	1		1	2		1	3
Holland	2	9	1	6	10	1	29	1,886		2						6	2	2	1	2	2	2	4		3				
Kingwood	6	2	1	4	8		21	1,694							1		1	3	2	1	2		3		1			1	
Lambertville	14	6	13	17	25		75	4,183		3	4		3			10	7	6	11	2	4	2	8		4	2	1	1	3
Lebanon	8	3	7	12	5		35	2,699			2		1			1	1	8	4	3	1		1		3		1	2	1
Raritan	9	4	2	15	22		52	4,188			2		1				4	8	1	2	7	4	7		2	2		3	
Readington	8	3	4	14	18		47	3,103			1					3	4	10	2	2	3	1	8	2	2	4			
Tewksbury	5	3	3	10	12		33	2,108		1	3					1		7	2	1	2	1	1		5				
Town of Clinton	4	1	2	7	9		23	842					1				1	4	1		3		2		2				2
Union	4		2	8	10		24	1,167								1	2	7	2	1		1	3	2	1	1		1	1
West Amwell	3		1	1	8		13	1,039								1	2		2	1	3		2			1	1		
Total	79	45	52	147	204	2	529			18	17		9		4	29	31	71	41	20	42	15	71	5	41	15	4	12	
Death rate per 1,000, of county									13.71																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

MERCER COUNTY. Population.......58,061 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Chambersburg	21	20	11	27	15	3	97	5,437	17.84	3	3	......	8	2	1	3	11	17	4	4	4	3	3	......	8	4	1	4	......
East Windsor	6	4	2	12	13	1	38	2,271	......	......	1	......	......	......	......	3	4	5	2	1	1	1	5	......	5	1	......	......	......
Ewing	......	1	1	23	16	3	44	2.412	......	......	......	......	......	......	......	......	......	13	......	1	6	......	18	1	1	2	......	......	......
Hamilton	6	5	4	18	16	2	51	3.370	......	......	2	1	2	......	......	2	3	7	9	......	3	2	4	1	5	2	......	......	3
Hopewell	6	4	7	11	15	1	44	4.462	......	......	2	......	......	......	......	2	5	6	3	3	4	3	5	......	2	3	2	......	2
Lawrence	19	6	6	16	7	1	55	3,174	......	2	5	......	1	......	2	1	6	6	9	6	3	......	2	......	1	2	......	1	1
Princeton	10	3	6	24	23	......	66	4.348	......	2	1	......	......	......	......	......	4	10	6	2	10	2	7	......	5	6	......	......	3
Trenton	117	79	36	191	127	15	565	29,910	18.89	10	19	......	20	......	4	16	48	101	56	46	26	20	40	3	30	17	4	8	......
Washington	8	1	3	7	8	......	22	1,281	......	......	1	1	3	......	......	......	......	3	3	2	......	......	1	......	2	1	......	2	1
West Windsor	3	2	1	3	6	2	17	1,396	......	......	2	......	......	......	......	......	4	3	1	......	......	1	2	......	......	3	......	......	2
Total	191	125	77	332	246	28	999	......	......	17	36	2	34	2	7	27	85	171	93	65	57	32	87	5	59	41	7	15	......
Death rate per 1,000, of county	......	......	......	......	......	......	......	......	17.20	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1,000, of county, excl'd'g city	......	......	......	......	......	......	......	......	14.83	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

MIDDLESEX COUNTY.

Population 52,286

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Cranbury	2	1	2	7	13	......	25	1,599	....
East Brunswick	8	5	5	15	17	......	50	3,272	....
Madison	4	5	1	10	6	......	26	1,662	....
Monroe	10	2	4	15	14	......	45	3,017	....
New Brunswick	78	46	36	94	67	2	323	17,166	18.81
North Brunswick	3	2	......	7	7	......	19	1 251	....
Perth Amboy	20	7	8	26	18	......	79	4,808	....
Piscataway	7	1	5	20	9	......	42	3,212	....
Raritan	7	1	8	17	18	......	51	3,789	....
Sayreville	5	2	1	9	4	......	21	1,930	....
South Amboy	17	9	6	22	15	......	69	3,618	....
South Brunswick	7	1	4	14	14	1	41	2,803	....
Woodbridge	13	8	2	17	17	2	59	4,099	....
Total	181	90	82	273	219	5	850	....	....
Death rate per 1,000, of county	......	......	......	......	......	......	......	....	16.25
Death rate per 1,000, of county, excl'd'g city	......	......	......	......	......	......	......	....	15.00

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cranbury	......	......	......	......	......	......	1	1	8	4	......	......	5	1	......	......	3	1	1	......
East Brunswick	1	......	......	2	......	......	......	8	6	5	......	4	2	1	1	8	3	......	......	1
Madison	......	......	......	......	......	......	2	5	5	4	1	2	......	2	......	3	......	......	......	1
Monroe	2	......	......	......	......	1	1	3	11	6	3	2	2	1	......	7	......	......	1	1
New Brunswick	5	10	......	14	1	4	14	44	43	31	16	22	16	23	2	11	8	1	4	......
North Brunswick	......	......	......	......	......	......	2	......	5	1	......	1	......	1	1	......	2	......	......	2
Perth Amboy	2	2	......	......	......	......	3	13	12	7	3	4	1	7	......	6	1	......	2	4
Piscataway	4	4	......	......	......	......	1	3	4	5	1	3	2	4	......	5	......	......	......	......
Raritan	4	......	......	1	......	......	2	1	6	4	3	8	1	4	......	4	......	......	......	5
Sayreville	......	......	1	......	......	......	......	2	4	4	2	1	2	1	......	1	......	......	......	......
South Amboy	3	2	......	......	......	2	5	8	7	4	3	1	......	3	......	8	3	......	1	7
South Brunswick	3	......	......	......	......	......	......	3	8	4	2	3	......	1	......	3	2	2	3	2
Woodbridge	4	......	......	......	......	......	7	9	6	2	4	1	2	7	......	2	2	......	1	2
Total	28	18	1	17	1	7	38	100	125	81	38	52	33	56	3	58	24	4	13	......
Death rate per 1,000, of county	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1,000, of county, excl'd'g city	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

MONMOUTH COUNTY. Population......55,538 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	4	2	3	8	10	......	27	1,743	......	......	1	1	......	......	......	1	4	3	2	1	2	1	5	......	2	......	......	......	......
Eatontown	11	6	1	6	16	......	40	2,642	......	4	......	......	......	......	1	1	7	2	......	4	3	2	5	......	5	1	......	......	1
Freehold	10	2	2	24	33	1	72	4,302	......	1	......	......	......	......	......	......	3	12	6	3	14	2	9	......	6	1	......	1	......
Holmdel	4	2	......	3	8	......	17	1,575	......	......	......	......	......	......	......	......	1	2	1	2	3	......	2	......	......	2	......	......	1
Howell	14	6	4	10	15	......	49	3,374	......	1	2	......	......	......	......	3	12	3	5	2	1	1	8	......	6	1	......	......	......
Manalapan	3	2	1	8	9	......	23	2,175	......	......	1	......	......	......	......	......	1	5	2	1	6	......	3	......	2	1	......	......	......
Marlboro	6	6	3	7	15	......	37	2,193	......	......	1	......	1	......	......	......	7	5	6	2	1	2	5	......	2	2	......	1	......
Matawan	10	7	8	19	15	1	60	2,699	......	......	7	......	......	......	......	3	7	10	5	4	3	......	3	......	6	2	......	1	3
Middletown	25	12	5	18	14	2	76	5,059	......	......	2	......	3	......	......	4	18	5	5	4	8	3	4	......	2	2	......	3	6
Millstone	2	7	1	5	13	......	28	2,080	......	......	......	......	......	......	......	......	5	1	3	2	1	......	4	......	6	1	......	......	......
Neptune	32	12	4	24	19	......	91	4,187	......	......	2	......	......	1	......	3	27	7	9	3	5	3	5	......	11	1	1	2	2
Ocean	32	24	10	25	23	1	115	6,027	......	3	......	......	10	......	......	4	22	11	6	12	5	3	8	......	7	2	......	1	9
Raritan	15	8	7	18	14	......	62	3,891	......	1	3	......	......	......	......	......	10	16	1	5	5	1	4	1	5	......	......	......	2
Shrewsbury	19	6	9	25	29	......	88	6,526	......	1	3	......	......	......	......	1	14	13	8	2	6	2	13	......	8	2	1	......	2
Upper Freehold	11	3	7	13	13	......	47	3,236	......	1	1	......	2	1	......	......	2	9	5	......	5	2	4	......	2	1	......	1	3
Wall	11	10	3	11	18	......	53	3,829	......	......	3	......	......	1	......	5	5	4	7	5	......	4	4	......	3	3	......	......	3
Total	209	115	68	221	264	5	885	......	......	12	26	1	16	3	1	25	145	109	71	52	68	26	86	1	73	22	2	10	......
Death rate per 1,000 for county	......	......	......	......	......	......	......	......	15.93	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

MORRIS COUNTY. Population .... 50,861. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boonton	9	7	6	12	14	2	50	2,682	......	4	2	......	2	......	......	3	10	2	3	1	5	7	......	2	2	3	......	......	3
Chatham	9	4	4	28	21	......	66	4,276	......	3	1	......	......	......	......	......	2	18	8	3	6	2	7	......	2	2	......	1	3
Chester	8	7	3	16	6	......	40	2,337	......	2	1	......	......	......	......	1	3	6	10	3	5	......	......	......	2	1	......	1	2
Hanover	7	3	4	20	45	1	80	4,138	......	......	1	......	1	......	......	......	3	10	15	2	4	2	19	2	7	......	1	2	3
Jefferson	5	4	3	9	6	......	27	1,792	......	3	......	......	1	......	......	1	1	3	6	1	4	......	2	......	1	......	......	1	2
Mendham	2	......	2	7	5	......	16	1,526	......	2	......	......	......	......	......	......	......	4	2	......	......	......	......	......	2	......	......	......	1
Montville	2	3	4	6	12	......	27	1,270	......	4	2	......	......	......	1	......	......	3	4	1	1	2	3	......	4	......	1	......	......
Morristown	14	8	5	44	37	1	109	6,837	15.94	2	1	......	1	......	......	5	9	16	7	6	8	7	34	......	4	......	......	1	2
Mount Olive	5	5	6	15	7	......	38	1,982	......	3	1	......	4	......	......	3	3	6	4	1	2	......	......	......	1	3	......	1	1
Passaic	3	5	3	6	15	1	33	1,896	......	4	......	......	......	......	......	3	4	2	3	2	2	2	3	......	2	1	1	......	1
Pequannock	9	6	1	9	13	1	39	2,239	......	2	......	......	......	......	......	3	2	4	2	3	3	1	4	......	2	1	......	1	2
Randolph	38	19	11	31	24	2	125	7,700	......	3	......	......	4	......	......	6	18	8	20	16	9	1	8	1	9	4	......	2	6
Rockaway	27	20	12	38	23	1	121	7,366	......	5	3	......	4	......	......	1	9	16	28	8	......	3	9	......	6	2	2	3	7
Roxbury	10	6	6	13	12	2	49	2,139	......	......	1	......	4	......	......	5	4	7	5	2	3	......	6	1	2	1	......	2	2
Washington	8	3	1	7	5	......	24	2,681	......	1	1	......	......	......	......	2	1	2	2	2	1	......	4	......	......	1	......	1	......
Total	156	100	71	261	245	11	844	......	......	38	14	......	21	......	1	33	69	107	119	51	53	27	99	6	46	19	5	16	......
Death rate per 1,000 of county	......	......	......	......	......	......	......	......	*17.02	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1,000 of county, excl'd'g cities	......	......	......	......	......	......	......	......	*17.12	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

* Correct. For fractional difference, see manuscript.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

OCEAN COUNTY. Population ..... 14,455. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Prain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Berkley	2	1	2	4	3	.....	12	683	.....	.....	.....	.....	1	.....	.....	1	.....	4	.....	.....	.....	1	3	.....	.....	.....	.....	.....	1
Brick	5	5	2	11	9	.....	32	2,990	.....	.....	1	.....	.....	.....	.....	1	6	5	2	2	3	.....	2	.....	4	.....	.....	.....	2
Dover	5	2	4	11	8	.....	30	2,439	.....	.....	2	.....	1	.....	.....	.....	2	5	3	1	.....	1	7	.....	2	.....	.....	2	.....
Eaglewood	4	1	.....	2	2	1	10	592	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	1	.....	.....	.....	3	1	.....	.....	.....
Jackson	3	8	4	3	10	1	29	1,803	.....	.....	.....	.....	4	.....	.....	4	3	3	3	1	2	1	1	.....	1	.....	.....	.....	2
Lacey	.....	.....	2	1	3	.....	6	814	.....	.....	.....	.....	.....	.....	.....	2	.....	1	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....
Manchester	4	2	2	2	8	.....	18	1,057	.....	.....	.....	.....	1	.....	.....	.....	2	2	1	.....	1	.....	1	.....	4	.....	.....	1	1
Ocean	.....	.....	.....	2	2	.....	4	484	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	.....	.....	.....	.....
Plumsted	7	.....	4	6	9	.....	26	1,561	.....	1	.....	.....	.....	.....	.....	1	4	4	.....	.....	2	.....	1	.....	2	3	.....	1	1
Stafford	.....	1	1	3	6	.....	11	1,088	.....	.....	.....	.....	.....	.....	.....	1	.....	5	.....	.....	1	.....	1	.....	1	.....	.....	.....	1
Union	4	2	1	6	7	.....	20	1,024	.....	1	1	.....	.....	.....	.....	.....	1	4	2	2	2	.....	.....	1	2	1	.....	.....	1
Total	34	22	22	51	67	2	198	.....	.....	2	4	.....	7	.....	.....	10	22	34	12	6	13	3	17	2	21	5	.....	4	.....
Death rate per 1,000 of county	.....	.....	.....	.....	.....	.....	.....	.....	13.69	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

PASSAIC COUNTY. Population ....68,860 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and Spinal diseases.	Erysipelas.	Digestion and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Aquackanonck	5	5	......	2	10	......	22	1,781	......	1	......	......	......	......	......	1	3	3	4	1	2	......	......	......	2	1	......	......	1
Little Falls	6	4	4	6	9	......	29	1,404	......	3	2	......	......	......	......	1	1	1	2	3	2	1	8	......	......	......	......	1	1
Manchester	4	3	1	6	8	......	22	1,513	......	1	......	......	......	1	......	1	2	2	......	2	5	2	......	......	1	1	......	......	2
Passaic City	48	19	9	40	13	......	129	6,532	19.44	......	......	......	4	1	2	3	20	21	16	12	7	9	6	......	2	1	1	2	......
Paterson	287	194	100	378	198	4	1161	51,031	22.75	24	29	......	11	9	4	83	140	197	144	95	55	41	48	6	50	20	2	12	......
Pompton	5	4	9	8	1	......	27	2,251	......	4	1	......	......	1	1	1	8	3	1	1	1	......	......	......	......	......	1	......	2
Wayne	4	1	2	7	9	1	24	1,757	......	3	......	......	......	......	2	......	2	3	2	1	......	3	2	......	2	1	......	......	......
West Milford	7	3	1	10	15	......	36	2,591	......	4	......	......	......	......	......	......	1	5	5	2	3	1	6	1	2	1	......	1	1
Total	366	233	126	457	263	5	1450	......	......	40	32	......	15	12	9	90	177	235	174	117	75	57	70	7	59	25	4	16	......
Death rate per 1,000, of county	......	......	......	......	......	......	......	......	21.05	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1,000, of county, excl'd'g cities	......	......	......	......	......	......	......	......	14.16	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

SALEM COUNTY. Population ....24,579 Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.			Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diptheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Elsinboro	1	......	......	......	1	......	2	570	......	......	......	......	......	......	......	......	1	......	......	......	......	......	......	......	1	......	......	......	......
Lower Alloways Creek	2	3	1	2	6	......	14	1,373	......	......	1	......	......	......	......	1	1	......	2	2	2	1	2	1	......	......	......	......	......
Lower Penn's Neck	5	2	2	3	2	......	14	1,334	......	......	1	......	......	......	......	......	2	2	4	1	2	......	......	......	......	......	......	......	1
Mannington	11	6	7	13	15	......	52	2,230	......	1	1	1	......	......	1	......	6	6	5	4	6	2	2	......	4	......	......	1	3
Pilesgrove	11	9	6	13	13	......	52	3 497	......	1	1	......	3	1	1	1	4	11	6	4	3	1	4	1	3	1	......	......	2
Pittsgrove	9	1	5	3	5	......	23	1,778	......	1	......	......	1	2	......	2	3	1	1	1	......	1	......	......	1	2	......	......	......
Quinton	6	3	1	1	2	......	13	1,390	......	......	......	......	2	......	......	......	1	1	2	......	1	1	......	1	......	......	......	......	......
Salem	17	10	2	20	25	......	74	5,056	14 63	......	2	......	......	......	1	1	5	14	16	1	5	1	6	......	8	1	2	......	1
Upper Alloways Creek	8	4	4	10	8	......	34	1,917	......	......	......	......	......	......	......	3	5	6	3	3	......	2	3	......	2	3	......	......	2
Upper Penn's Neck	10	3	8	7	17	1	46	3 361	......	3	1	1	1	......	......	3	5	5	6	4	2	......	4	1	4	1	......	......	......
Upper Pittsgrove	7	4	4	6	7	......	28	2,073	......	......	2	......	......	......	1	1	6	3	......	2	......	1	4	......	1	2	......	1	......
Total	87	45	40	78	101	1	352	......	......	6	9	2	6	3	4	12	39	49	45	22	21	10	25	4	24	10	2	2	......
Death rate per 1,000 of county	......	......	......	......	......	......	......	......	14.32	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Death rate per 1,000 of county, excl'd'g cities	......	......	......	......	......	......	......	......	14.23	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

SOMERSET COUNTY. Population ..... 27,162. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Bedminster	5	1	3	13	8	......	30	1,812	....
Bernards	3	3	4	12	14	......	36	2,622	....
Branchburg	3	2	1	4	6	......	16	1,316	....
Bridgewater	37	12	17	50	28	2	146	7,997	....
Franklin	12	5	4	17	17	......	55	3,818	....
Hillsborough	7	3	3	16	13	......	42	3,248	....
Montgomery	3	1	4	7	9	1	25	1,928	....
North Plainfield	6	5	4	9	11	1	39	3,217	....
Warren	2	......	6	4	4	......	16	1,201	....
Total	78	32	46	132	113	4	405	....	....
Death rate per 1,000 of county	......	......	......	......	......	......	......	....	14.91

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bedminster	2	1	......	......	......	......	1	1	8	4	......	2	......	3	......	2	......	......	2	......
Bernards	......	1	......	......	......	1	3	3	7	4	1	1	......	4	......	3	1	1	1	......
Branchburg	1	......	......	1	......	......	1	2	3	3	......	......	1	2	......	......	1	1	......	......
Bridgewater	7	1	......	1	......	1	11	16	22	11	4	9	5	11	2	13	3	......	5	7
Franklin	4	3	......	......	......	......	1	10	6	9	......	6	2	3	......	6	......	1	1	3
Hillsborough	1	......	......	......	......	1	2	1	10	4	......	1	1	5	1	1	1	4	......	1
Montgomery	......	......	......	2	......	......	1	2	3	2	1	2	......	3	......	2	2	......	......	2
North Plainfield	......	......	3	......	......	......	5	5	7	2	......	2	......	6	......	3	......	......	......	......
Warren	......	......	......	3	......	......	1	2	4	2	......	1	1	1	......	......	......	......	......	......
Total	15	6	3	7	......	3	26	42	70	41	6	24	10	38	2	30	8	7	9	......
Death rate per 1,000 of county	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

SUSSEX COUNTY.

Population 23,539

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.
Andover	3	2	4	5	2	1	17	1,150	
Byram	3	2	3	7	8		23	1,406	
Frankford	8	4	3	6	10		31	1,682	
Green	1	1	1	3			6	727	
Hardyston	2	4	1	10	5		22	2,645	
Hampton	2		2	2	1		7	895	
Lafayette		2	1	5	6		14	781	
Montague	3	2	1	3	1		10	1,022	
Newton	2	1	2	20	5		30	2,513	
Sandystone	3	4	1	4	7		19	1,195	
Sparta	10	3	1	16	8		38	2,274	
Stillwater	4	2	4	8	12		30	1,502	
Vernon	6	4	2	7	5		24	1,811	
Walpack			1	2	1		4	575	
Wantage	2	7	5	12	19		45	3,361	
Total	49	38	32	110	90	1	320		
Death rate per 1,000 of county									13.59

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Puerperal.	Accident.
Andover		1		2		2	1		1		2	1	1	2			1		1	
Byram		1					1	5	3	1		1		5					1	3
Frankford	5							4	3	1	3	1	1	1		1				3
Green							2		1			1					1			
Hardyston	1	1					1	2		7	1	1	1	2			1		1	1
Hampton									2	2		1					1			1
Lafayette								2	1		1	3		3		1			1	1
Montague	1			1				1	2							1				2
Newton		1						1	10	3	1	4	1	1		3			2	1
Sandystone								4	2		1	1	1	3	1		1			1
Sparta								4	3	6	5	2		8		1	1			3
Stillwater	1					1	2		3	4	2	5		3	1	2	3			1
Vernon	1	1					2	3	4	4	1		1	1			1	1		
Walpack											1	1				1				
Wantage	3	2		1			1	3	9	5	4	3	2	5		1		1	1	
Total	12	7		4		3	10	29	44	33	22	25	8	34	2	11	10	2	7	
Death rate per 1,000 of county																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

UNION COUNTY. Population ......55,571 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhoeal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clark	4		1	2	1		8	353		1									2				2						
Cranford	3	7	1	4	8		23	1,184		3						7	1	1	1				3		3	1		1	
Elizabeth	140	74	56	193	101		564	28,229	19.97	7	8	1	7	2	5	19	59	95	77	58	23	10	32	2	30	11	3	5	
Fanwood	2	3		1	8		14	1,167		1			1			1	1	2	2	2	2								
Linden	5	1	3	12	8		29	1,889			3		3				2	1	2	2	1	1	4	1	2	1			1
New Providence	5		3	4	2		14	781		2							2	2		1			1			1			1
Plainfield	34	22	7	32	35		130	8,125	16 00	1	3	1	2		1	8	18	24	12	10	5	7	5	2	8		1		
Rahway	14	11	7	44	28		104	6,455	16.11	3	1		6				8	11	15	6	6	4	15	3	6	4		1	
Springfield	1	3		6	6		16	814		3			1			1	1	5			2			1					
Summit	4		3	6	6		19	1,910		1						1	1	1	2	3	1	1	1		2	2			1
Union	4	6	3	8	5		26	2,418		2			1				5	5	1	3	1	1	1			1			2
Westfield	14	8	9	7	8	1	47	2,216			2		3			6	6	4	6	5	1	1	2	2	2				2
Total	230	135	93	319	216	1	994			24	17	2	24	2	6	43	104	151	120	90	42	25	66	11	53	21	4	7	
Death rate per 1,000 of county									17.88																				
Death rate per 1,000 of county, excl'd'g cities									15.35																				

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1881.

WARREN COUNTY. Population ..... 36,589. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, etc.	Typhoid fever.	Smallpox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrhœal diseases.	Consumption.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal Diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Allamuchy	2	1	1	3	2		9	648			1						2	3	1			1							
Belvidere	3	1	4	11	5		24	1,773		1	2					1		5	4			1	4	2					1
Blairstown	4		2	6	10		22	1,458		2							1	3	3	1			2	3	5				
Franklin	3	2	3	7	6		21	1,529								2	1	4	1	1	1	1	3	1	1	1	2		1
Frelinghuysen	2	1		3	9		15	1,042			1					1		4	2				2		3	1			
Greenwich	5	8	9	13	10		45	2,554		1	1					7	5	8	6	3			3	1	3	1			2
Hackettstown	6	3	3	14	8		34	2,502								1	4	7	3	4	2		3		4			1	1
Hardwick				1	1		2	583																	1				1
Harmony	3	1	3	3	6		16	1,350								1		2	2	3	1	1			2	1			
Hope	3	3	3	5	11		25	1,569								5	2	2	1		1	1	2		3	1			2
Independence	4		1	8	2		15	1,018									1	5	3	2	1	2							
Knowlton	3	1	2	1	8		15	1,476								1	2		1	1	4	1	1		1				
Lopatcong	6	2	4	4	4	2	22	1,591			1			1		2	2	4			1	1	2		1				2
Mansfield	5	2	3	9	11		30	1,709			2					2	3	4	2		2	1	3		5	2	1		1
Oxford	16	11	6	17	12		62	4,594		1	5		1			6	12	2	6	4	6		3		1	1		1	2
Pahaquarry			1	2	1		4	418					1					1	1		1								
Phillipsburg	34	12	14	35	19		114	7,181	15.87	2	7		1			6	9	15	18	6	5	2	6		5	1	1	5	6
Washington, Borough of	11	8	5	5	7		36	2,142					2	2		4	5	2	2	3	2	2	2		4				1
Washington Township		2	4	8	6		20	1,452					2			1	1	2	1		1	2	4	1				1	2
Total	110	58	68	155	138	2	531			7	20		7	3		40	50	73	57	28	28	16	40	8	39	9	4	8	
Death rate per 1,000, of county									14.51																				
Death rate per 1,000 of county, excl'd'g city									14.18																				

MEMORANDUM AS TO VACCINATION.

The series of facts already secured by the Committee on Vaccination, seem to enforce the importance of a careful re-study of the potency of the various forms of the vaccine virus in the prevention of small-pox. There is need, also, of close personal observation and investigation on the part of medical men. It has been thought best to postpone the paper promised on this subject until another year, and in the meantime to enlist the attention of the physicians of the State. We invite correspondence and the expression of opinion upon the following points, and such others as may suggest themselves to practitioners:

I. Should the use of bovine virus supersede the use of humanized virus?

II. What phenomena, if any, have occurred in the use of bovine virus, as distinct from what has been heretofore noted as to the humanized Jenner virus? Such as (*a*) time of maturity; (*b*) degree of sickness; (*c*) proportion of local to general effect; (*d*) as modified by the number of pustules; (*e*) as showing herpes or other skin irritation; (*f*) as to period of protection, etc.

III. Are we able to arrive at any law as to how frequently vaccination should be repeated?

IV. Should there be a law of compulsory vaccination?

V. How far should *revaccination* be insisted upon in attendance at public schools?

VI. How far can we determine the efficacy of the vaccination by the scar?

VII. Should we not adopt the plan of giving certificate of vaccination, so that the facts as to its proper doing may be more fully known?

VIII. In what way shall practitioners be assured of the purity and freshness of virus?

Our desire is to get at the accurate experience of practitioners in this State. The history of vaccination is well known. But we seek

the facts in evidence as to all changes wrought by animal virus, and shall be glad to aid or be aided by those who will help to perfect the art of vaccination. Such outlines of facts as those furnished by Dr. Boysen, of Egg Harbor City, or Dr. Daly, of Rahway (page 159), are of much value. We seek the careful opinions of physicians as to the significance of the facts they observe in the use of vaccine. Thus we seek to aid in making the knowledge as to vaccination so definite, with physicians, as to allay the fears and prejudices of families, and to secure the largest protection to the greatest number.

GENERAL INDEX TO SUBJECTS

I.—REPORT OF THE BOARD OF HEALTH.

II.—REPORT OF THE BUREAU OF VITAL STATISTICS.

ERRATUM.—In Hoboken, Hudson county, scarlet fever is 36, instead of 26.

NOTE.—See page 207 for instructions to Health Boards. Assessors must see to it that the health report is kept for the Board.

NOTE —The Commissioner of Agriculture has, at the desire of the Board, kindly furnished to our Local Boards of Health a copy of the excellent report on the contagious diseases of animals. It must be kept for permanent reference.

ALPHABETICAL INDEX.

SIXTH ANNUAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY.

1882.

WOODBURY, N. J.:
JAMES D. CARPENTER, PRINTER.

1882.

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JAMES D. CARPENTER, PRINTER.

1882.

THE STATE BOARD OF HEALTH.

Hon. Henry C. Kelsey, Secretary of State, Hon. John P. Stockton, Attorney-General, George H. Cook, State Geologist,	Members ex-officio.

	P. O. Address.
Prof. A. R. Leeds, Ph. D.	Hoboken.
Ezra M. Hunt, M. D.	Trenton.
E. A. Osborn, C. E.	Middletown.
E. S. Atwater, Counselor-at-Law	Elizabeth.
Laban Dennis, M. D.	Newark.
Prof. Cyrus F. Brackett, M. D.	Princeton.
Franklin Gauntt, M. D.	Burlington.

President	C. F. Brackett.
Secretary	E. M. Hunt.
Recording Clerk	E. A. Osborn.

REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency, George C. Ludlow,

GOVERNOR:—In behalf of the State Board of Health of New Jersey, I beg leave to present to your Excellency the sixth report of the Board. In no previous year have the duties which have devolved upon it been so numerous, or its relations to the local and general interests of the State so responsible. This is because the public mind has become impressed with the fact that much of sickness arises from avoidable causes; because local Boards oftener have occasion to consult us as to the means of abating or preventing evils injurious to health and life, and because some laws passed by the last Legislature enlarged the field of our inquiry. Health administration on the part of the State is no longer looked upon as only a charity, or as one of the general ways which a government has of indicating its interest in its citizens. Neither is it a plan for meeting only the emergencies of a sudden epidemic. It takes the higher and well-sustained view that race vitality, physical vigor and the avoidance of the ascertained causes or concomitants of disease, are essential to the welfare of the people and to the prosperity of the body politic. It sees that a State, in its organic capacity, cannot ignore so indispensable a condition to its development and progress. Our social and national status is determined not less by the vigor of the body than by the education of the mind. Indeed, education which does not give large attention to bodily health is itself defective. Political economy no longer closes its eyes to the significance of inquiries into the health of the population, as bearing upon all questions of industry, finance and thrift. The health of the laborer is not only an element in "the production of wealth, but in the permanency of the State." The health of the family defines the capacity of wages to confer comfort and self-support, more than does the numerical statement of dollars and cents. Not less does it concern *all* citizens and all families in a common defence and a mutual interest to see to it that no oppressive tax is

levied by the burdens of avoidable disease. If so, palsied industries, depressed spirits and inadequate means conjoin to degrade the people, and life, liberty and happiness are alike imperiled. As a practical infusion of energy and power into the people, no plan would be so successful as that which would reduce to a minimum the occurrence of ill-health and disease. The power that a State has thus to appreciate and in fact determine the physical vigor of its population, is no longer questioned, and the importance of giving large attention to its securement is too often painfully manifest. Mr. Spencer, in his recent visit to this country, in a criticism as kind as it is discerning, says: "In every circle I have met men who had themselves suffered from nervous collapse due to stress of business, or named friends who had either killed themselves by overwork, or had been permanently incapacitated, or had wasted long periods in endeavors to recover health. I do but echo the opinion of all the observant persons I have spoken to that immense injury is being done by this high-pressure life—the physique is being undermined. That subtle thinker and poet whom you have lately had to mourn, Emerson, says, in his essay on the gentleman, that the first requisite is that he shall be a good animal. The requisite is a general one—it extends to the man, to the father, to the citizen. We hear a great deal about 'the vile body,' and many are encouraged by the phrase to transgress the laws of health. But nature quietly suppresses those who treat thus disrespectfully one of her highest products, and leaves the world to be peopled by the descendants of those who are not so foolish.

"Beyond these immediate mischiefs there are remoter mischiefs. * * * * Also, there is injury to the posterity. Damaged constitutions re-appear in children and entail on them far more of ill than great fortunes yield them of good. When life has been duly rationalized by science it will be seen that among a man's duties care of the body is imperative, not only out of regard for personal welfare, but also out of regard for descendants. His constitution will be considered as an entailed estate, which he ought to pass on uninjured if not improved to those who follow; and it will be held that millions bequeathed by him will not compensate for feeble health and decreased ability to enjoy life."

To this Board has been assigned the duty of taking "cognizance of the interests of health and life among the citizens of this State; of making sanitary investigations and inquiries in respect to the people, the cause of disease and especially of epidemics, and the sources of

mortality and the effects of localities, employments, conditions and circumstances on the public health." Such inquiries not only call for a general superintendence over the more vital concerns of population, but lead us to co-operate with local Boards and governing authorities in all that relates to information and advisement for the public health. Besides the broad field of inquiry which the constituting act suggests, the Legislature has, from time to time, specified the direction and method of special investigations, and so has not left us in doubt both as to the extent and significance of the work.

The year just closed gives us the general fact as to the vital movements of the population, that there have been 8837 marriages, 23,108 births, 25,942 deaths. The report of the Bureau of Vital Statistics more fully states and analyzes the significance of these figures. It may well be noticed here, however, that for the statistical year which ended July 1st, 1882, there was an increase of 5130 over the previous year. Some of the increase was directly owing to the exceptional winters and summers of the years 1879–80 and 1880–81. But when we take the low death rate of choice localities in the State and compare with it the losses in some cities, and then, again, in the excessive infant mortality trace the unfriendly influences which kill the younger population, and depress and shorten older lives, it is easy to see that much of this might be avoided. The occurrence of malaria and of two or three typhoid endemics, will be noted in another connection. Local outbursts of diphtheria have occurred at New Hampton, New Brunswick, Bridgeton, Dover, Newark and Phillipsburg, and to a less degree in a few other localities. Measles has been largely epidemic in the State, but not in a fatal form. The tables of death rate show a somewhat diffused prevalence of scarlet fever.

Small-pox, as noticed in the last report, affected many localities in the State. The efficiency of local Health Boards and the more intelligent views of early isolation and vaccination, alone prevented it from becoming a general epidemic. With an early infection of Camden and Hoboken and several foci of the disease started in the State, it was only the vigilance of local authorities that confined it within limits. We have had from various points most satisfactory evidence of the value of this attention, and have been able to help local Boards in rapidly perfecting methods of quarantine and protection. The experience of Paterson was more unfortunate, and was complicated by the distribution of some useless vaccine lymph. Yet here a severe epidemic was checked by giving additional powers to health officers.

Much has been learned as to methods of guarding against imperfect vaccine lymph. Papers which form a part of this report, give valuable information to the people as well as to physicians, on this subject. Fuller details as to other diseases will be found in the report of the Medical Superintendent of State Vital Statistics.

WATER-SUPPLY.

The securement of a healthy water-supply for the citizens of this State is so obvious a necessity that we only have reason to point out the risks of its pollution, and the sources from which a supply is to be derived. In order for this the water-sheds of the State and its natural drainage need to be carefully considered. The pollution of wells in crowded cities is almost inevitable, and hence the chief reliance has to be placed on a general water-supply. Driven wells have been used in some parts of the State to advantage. These are often found to be impregnated with mineral matter, so as to be unpalatable, and even organic matter, through sandy soil, reaches them far deeper than would be supposed. Cisterns properly constructed and under careful supervision, provide for many places where well-water, or a public supply, is not available. About thirty of our cities already have water-works. Somerville and Orange have introduced water the past year, and Princeton, Asbury Park, Atlantic City, Gloucester City and other towns are busy in the planning or execution of methods. There is need of the wisest forethought in providing for present and prospective population, and especially in reference to that area included within thirty miles of New York city, which alone contains one-half of the population of the whole State. Your Excellency, it will be remembered, drew the attention of the Legislature of 1882 to the subject in your first annual message, as follows:

"The two largest cities of the State, and much of the thickly-settled surrounding country, derive their supply of water from a stream defiled by the emptyings of manufactories and sewers for miles above the point at which it is drawn. This condition of affairs must continue to grow worse, since the natural growth of the communities increases alike the demand for pure water and the contamination of that upon which they depend. Fortunately, the evil is not irremediable. The natural channels of the Passaic river bring to within fifteen (15) miles of Jersey City, and a shorter distance from Newark, each day over four hundred million (400,000,000) gallons of pure

water, gathered from streams, springs and lakes of a mountainous and thinly-settled district of country. This immense quantity is delivered in a pure condition at a point one hundred and fifty (150) feet above the level of the sea, from which an easy descent can be made to the places where it is to be distributed. There is urgent necessity that this should be utilized for the benefit of the three hundred thousand (300,000) people who need it, especially as it is, at all times, liable to be pre-occupied by mills or taken by some single municipality, or, possibly, bought to satisfy the pressing want of the neighboring metropolis. The importance of this subject cannot well be over-estimated, since it includes within itself the health and prosperity of the most densely-populated and thriving portion of our State."

J. Bailey Denton, in his work on "Sanitary Engineering," p. 37, says:

"In mountainous and hilly districts, where sufficient areas of impervious gathering grounds can be found is the best means of supply, because it is of a character over which the engineer has most command. * * * I refer to the storage of rain-water therein off uncultivated surfaces, and collected before it becomes contaminated by foreign matter."

The Legislature, in the protection of this interest, passed "An act to provide for the appointment of commissioners to determine upon plans for the storage of any of the waters of this State for the purpose of furnishing to cities and towns a joint water-supply." (Ch. 189, Laws of 1882.)

Under this act Ashbel Welch, C. E., of Lambertville; Henry L. Butler, of Paterson; George Randall, of Newark; and Andrew Clerk, of Jersey City, were appointed commissioners. The sickness and lamented death of the distinguished chairman of the commission have delayed action. The commission will, no doubt, give thorough attention to the important work committed to its investigation.

Camden and other cities in the south and west of the State, also need carefully to guard their sources of supply. Because of the changes that are constantly taking place in the head-waters of streams or the various pollutions to which they may be subjected, there is constant need of supervision by the Water Boards in charge.

DRAINAGE.

"Drainage for Health," is one of the subjects, the importance of which needs to be most earnestly impressed.

"Perhaps," says Engineer Denton, "the most fruitful source of impurity of air in dwellings, is the damp condition of the ground immediately beneath and adjacent to them, which often becomes saturated with liquid filth by the too frequent practice of throwing the slops of the dwelling on the surface of yards or gardens, or by heaping upon it solid refuse of all sorts, to be washed into the soil by the rainfall, and to give off effluvia from their accumulated heaps, or to spread their minute particles in the air and be taken into the lungs by respiration. Soil, where drained or aërated, has an (p. 13) almost immeasurable power of cleansing any liquid that may enter and pass through it." But it is because in cities the ground is so often soaked with water as to furnish it stagnant water in place of circulating water and circulating air, that it becomes filth-sodden. Having no crop to consume the organic materials, it gives off its gases to the air to be inbreathed by persons. Such soil is also kept so wet as to reduce its temperature, while, by evaporation, greater cold is produced upon its surface. Such ground is always subject to such variations as are most unfriendly to health. Hence, "drainage has the effect of improving the temperature of the air incumbent upon the ground, as well as of raising that of the soil beneath."

After illustrating, by many facts, the effect of insufficient drainage on health, he says:

"The maintenance of pure air by the under-drainage of the soil surrounding or beneath dwellings, is an object only inferior in importance to the removal of putrescible matters. That this object is one of the most important that can engage the attention of the sanitary engineer cannot be denied, when it is shown, upon the authority of Dr. De Chaumont, that long-continued exposure to bad air tends to the production of scrofula and consumption—of which latter disease it is probably the most efficient cause. That it promotes enteric fevers; that it fosters ailments of the respiratory organs, such as catarrh, bronchitis and pneumonia; that it is frequently the cause of inflammation of the eyes, and that it adds to spread of the small-pox, measles, scarlet fever and the like, while it renders the rapid cure of wounds and sores of all kinds a work of great difficulty, is well known."

When it is remembered that water-courses or nature's natural drain-

age areas are constantly being disturbed by obstructions such as mill-dams, or by excavations and embankments, we are to see to it that some compensations are made for these. In cities, especially where ground is shaded by buildings, and an amount of water added to the soil which doubles the usual rain-fall, we are not to be surprised if there is an increase of most forms of disease and a lowering of the general vitality. It is not by a figure of speech that cities thus become "the graves of mankind." Science would prove what must be, even if experience had not proven it beforehand. In these modern days, with great increase of activities and with more ready means for rapidly distributing air and earth and water, we must inevitably have an increase of disease, unless some of our abilities at construction are applied in the direction of preservation and of compensation for evils which are otherwise destructive. Hence, a low level of ground-water is desirable for all cities, and only such access of storm-water and household-water supply as does not seriously or permanently raise the ground level. The facilities for drainage and the modes of its accomplishment are now well understood, so that the advantages thereof can be applied to the prevention or relief of much of the sickness that now occurs from over-damp building sites. In the same city there is often a great contrast as to strata and the average height of ground-water. Statistics, such as those of Pettenkofer as to Munich, of Dr. Snow as to London, and of Dr. Knight as to the Rochester and Medway districts, seem conclusively to show how mortality is increased by a wet subsoil.

MALARIA.

What to do to prevent malaria and malarial disease is not likely to cease to be a subject of earnest inquiry for long years to come. The fact that the evil has extended to parts of New England, where it had not before existed, and that in New York State and this State some places are affected which had long boasted of exemption, shows that there is at least no decrease in extent. New Jersey is not more exposed to the circumstances which occasion it than some other States, but we have especial need to study and guard against it, because where it does not cause death or find record in intense sickness, it does depress vital force, interfere with labor, become chronic in its effects and give a type to many fatal diseases. All the more because the agencies in its production are multiplied by the activities of such a State as this.

The removal of forests, the changing of water-courses, the excavations for railroads and various public improvements, the rapid building of cities and the mining of ore, clay, marl, etc., all tend to provide the best conditions for the malady. So far from diminution, we are only to expect its more rapid increase or more frequent recurring epidemics thereof unless we avail ourselves of methods of restriction. Dr. Snow, of Rhode Island, has so well stated its incursion into parts of that State, and illustrated so well the points at issue in dealing with it, that we quote from a letter of his to the Common Council of Providence, May, 1882:

"For a better understanding of the subject, it may be well to refer briefly to the cause or causes of fever and ague. In this vicinity, where we have never been familiar with the disease, there is much uncertainty and difference of opinion among the people in relation to its causes, and the most absurd theories are given upon the subject. In the locality referred to, we have been told that cases of the disease were caused by the water in Mashapaug Pond, other cases by heaps of animal matter, others by offensive sink drains, &c.

"In places where fever and ague has been a long time prevalent there is no such difference of opinion in regard to its causes. The real cause is well known. It may be stated briefly to be a poison in the atmosphere, commonly called '*malaria*,' which is generated in and arises from swamps and swampy places. Water alone, in ponds or running streams, can never cause fever and ague, dry earth can never cause it, decaying vegetable matter alone can never cause it; but it is produced by the combination of water, earth and decaying vegetable matter in the conditions usually found in swamps and so-called swampy places. It may be stated as a general truth, that so far as is known, fever and ague has never been produced except by swamps or swampy places.

"It is true that all swamps do not produce fever and ague, and none of the swamps in Rhode Island have produced it, within the memory of the oldest inhabitants, until within the last two or three years. Within that time a new element has come into the swamps of Rhode Island which did not exist there before, and which, existing in the swamps, produces the malaria of fever and ague. What this new element is, whether vegetable, animal, or something else, no one knows. We know that it has been gradually traveling from the vicinity of New York city, up the rivers and valleys of New England, during the last ten or fifteen years. We know that whenever it has reached a swamp, or swampy region, it has remained permanently, and has given rise to fever and ague, from year to year. But the fact still remains true, and this fact is important to be remembered, that fever and ague is never produced except by swamps and swampy places, and if the swamps are removed the disease is effectually prevented. Let us now return to the district about Mashapaug Pond, where the fever and ague has been prevalent during the last two years. * * *

"There is a considerable number of ponds and low swampy places in the malarial district referred to that are not marked on the city maps. The height of the water in all of these ponds and swamps, as well as in the ground throughout the malarial district, *is governed entirely by the height of the water in Mashapaug Pond.* At the present time, the water in Mashapaug Pond is three and a half to four feet above its natural level. The results of this are as follows:

"1. There are many acres of swamp on the borders of Spectacle Pond and on the brook leading from Spectacle to Mashapaug Pond, that are made swamp wholly by the extra height of the water in Mashapaug Pond. All these acres of swamp would be dry ground if Mashapaug Pond was kept at its natural level.

"2. The high water in Mashapaug Pond keeps all the numerous swampy places and hollows in that district in a swampy condition, so that all the dangerous effects of swamps are produced by them.

"3. The high water in Mashapaug Pond keeps the ground water in the whole district so high that many hollows are more or less wet, and many cellars are damp and unhealthy.

"4. In the swamps made by this high water the vegetable growth is luxuriant, and as the water falls in the late summer and autumn this vegetation dies and produces the conditions most favorable for the production of fever and ague.

"The conclusion from the preceding seems to be unavoidable—

"That the high water in Mashapaug Pond in the spring and early summer, making much swamp and swampy land with rank vegetation, and the fall of the water in the late summer and autumn producing decay of vegetation, are the principal, if not the sole cause, of prevalence of fever and ague in that vicinity.

"The important question is, What can be done to prevent the disease? Generally and everywhere, the disease can be prevented by the destruction of the swamps, and in no other way."

The cases referred to not only illustrate the correct views as to the combination of influences at work to produce remittent fever, intermittent fever, chills and fever, periodic neuralgia, and an interfering type of periodicity in other diseases, but also shows how a condition of high water in a lake, which would seem effective for the prevention of malaria, causes it to abound in adjacent grounds.

If there is any one point established in medical experience it is the relation of water, earth and decaying vegetable matter, acted upon by heat, to the occurrence of malaria. This does not assert that in every instance the coincidence or co-existence of these will produce malaria, any more than it is asserted that certain conditions of heat and filth will always give rise to cholera, scarlet fever, typhoid fever, etc. Sometimes a swamp or pond, filled with vegetable matter, seems to catch the malaria, and ever after to be able to reproduce and furnish it, and then our only remedy is to get clear of the pond. In other cases, all the factors of the disease seem to have met in just the proportions to produce the disease, and then we have it arising *de novo* or spontaneously, and ever after it is found endemic there unless the original cause is removed.

It is no harder to account for the coming of malaria to a certain locality, where it had not been before, than it is to account for the arrival of potato bugs to a section they never had invaded before. A

disease, like a plant or animal, locates where it finds food adapted to it. Unlike a plant or animal, it sometimes originates perhaps by chemical, perhaps by germinal forces from a place adapted also to its nourishment. When, as in very many diseases, we cannot detect the particle that infuses the disease into a human system, we may, nevertheless, detect the surroundings or influences which tend to foster the infection, as also the laws of its selection, both as to places and individuals, and the preventions or limitations which we may institute. While not ceasing to look for the germinal cause, or to feel the radical advantage of finding it, practically we do very much to vacate the disease if we can remove the surroundings which produce, nurture or multiply it, or define what persons it is most liable to attack, or how its attacks shall be prevented. On all these points we know far more than we are permitted to execute. For instance, the preservation or restoration of natural water-courses, or the providing of drainage where there is need of additional drying, the thorough cropping of the soil and limitation of vegetable decay, will do much to limit or prevent the disease. And as to persons, the avoidance of exposure to damp and night air, the sleeping in upper apartments, regular living, and, in some cases, the use of prophylactics and especial care until a kind of acclimatization has been attained, have practically much to do with the prevention of malarial diseases.

Also, we regret to say that we are too often multiplying its causes, when, for instance, a house, a village or a city is found without any previous deep drainage system. By the houses we build, and various other changes, we are interfering with evaporation and dampening the ground. Rain-water and refuse matter no longer yield themselves to a crop vegetation and sun-heat increases. Thus, unless additional drainage is instituted there is new water soaking, and there is fertilizing without cropping, and all the conditions either for producing or inviting the locality of malaria. Hence, each city tends to make of itself a centre of malaria, and even when partially caring for itself by avoiding vegetable decomposition, is apt to load its suburbs with all the materials of a malaria manufactory. Added to all, the natural drainage is very often interfered with. Our nearest way out of this trouble is to avail ourselves of our excellent State provisions for drainage, and to commit all our cities and townships to the care of such local Boards as will appreciate the cause of disease, and aid in giving correctness to public opinion until a sufficient number will

appreciate the necessity and authorize the work. It is fortunate that the advantage to property is as real as that to the general health.

CITY SEWERS.

Whatever may be the theories of individuals as to various modes of delivery of sewage, the fact must be admitted that the weight of authority inclines more and more to the approval of sewers as the appliance for the riddance of water-closet material and the general liquid refuse of households, factories, etc. It is no longer a question that these can be constructed so as to secure air and water-flushing, and be so connected with houses as to prevent evils from sewer gas and furnish safe conduits for the delivery of house liquid refuse. Great advance has been made in the last few years, in our knowledge of how to construct sewers properly and economically; how to secure proper flushing and ventilation; how, by traps and ventilators, to prevent the passage of air therefrom to houses, and thus how to make of them safe conduits for the prompt delivery of material which has no place within city limits. Objections made apply to avoidable imperfections or to neglects in administration rather than to inherent and unavoidable defects. While dry systems or cart delivery may serve in special cases and for smaller towns and villages, these generally fail, as applied to close populations. The question whether sewers shall be made to carry storm-water as well as house liquids, or whether land drainage shall be in any way combined, are questions to be decided by locality and circumstances; also, the question whether the outflow shall be into a river or into the ocean, or for surface or subsoil irrigation and fertilization of farms, or over a filter-bed previous to a river-flow—all these are subsidiary and collateral questions, to be decided on their merits for the locality. The one fact that city filth should not have city storage or be allowed to find its way into the soil, the water or the air of a city, is so important and undeniable that no city should satisfy itself with neglect or with half methods. The language and illustrations of Capt. Douglas Galton, in his recent address at the Fifth Congress of the Sanitary Institute of Great Britain, are worthy of note, as emphasizing the importance to be attached to the method of sewage and carriage. He says:

"There is no doubt that in the sewering of towns, want of experience in the construction of the works has, in some cases, led to deposits in the sewers, and to their failure to remove these dangerous gases, and that evil consequences have ensued;

but it may be accepted as certain that in every case where the sewerage has been devised on sound principles, and where the works have been carried on under intelligent supervision, a largely reduced death-rate has invariably followed. The records of New Castle afford evidence of this fact. The quinquennial period, beginning in 1868, showed a death-rate of 27.6; the quinquennial period ending in 1881, showed a death-rate of 23, whilst the death rate of 1881 was only 21.7.

"At the recent Sanitary Congress at Vienna, some remarkable results of the effects of the sewerage of certain German towns were given, which are very striking. Munich is the residence of one of the ablest sanitarians of Europe, viz., Dr. Pettenkofer. His admirable illustrations of the effect of the impurities which were accumulated in porous cesspits, upon the air of the town and the death-rate of the population, form a text-book of sanitary knowledge. At Munich the enteric fever mortality per 1,000,000 of inhabitants for quinquennial periods, was as under:

1854 to 1859, when there were absolutely no regulations for keeping the soil clean	24.2
1860 to 1865, when reforms were begun by cementing the sides and bottoms of the porous cesspits	16.8
1866 to 1873, when there was partial sewerage	13.3
1876 to 1880, when the sewerage was complete	8.7

"Similarly, at Frankfort-on-the-Main, the deaths from enteric fever per 10,000 were:

1854 to 1859, when there was no sewerage	8.7
1875 to 1880, when the sewerage was complete	2.4

"At Dantzig, the figures present some more striking characteristics; the deaths from enteric fever per 100,000 living, were as follows:

1865 to 1869, when there was no sewerage and no proper water-supply	108.
1871 to 1875, after the introduction of water-supply	90.
1876 to 1880, after the introduction of sewerage	18.

"Hamburg has been drained by Mr. Lindley, and he has stated that in his plans he carefully followed the principles laid down by Mr. Chadwick. In that town, the deaths from enteric fever per 1000 of total deaths, were:

From 1838 to 1844, before the commencement of the construction of any sewerage works	48.5
From 1871 to 1880, after the completion of the sewerage works,	13.3

"During the time that the works were in progress, viz., from 1872 to 1874, the mortality from enteric fever per 10,000 living, was:

In the unsewered districts	40.0
In the districts for the most part sewered	32.0
And in the fully sewered districts	26.8

"These results illustrate the effect of purifying the air of towns by the rapid abstraction of refuse matter, so as to prevent it from remaining and putrefying in and upon the ground."

Dr. J. W. Tripe, another eminent authority, thus speaks of the relations of soil, air and organic matter:

"As all the interstices of the ground are filled with air, the more porous the soil the greater is the quantity of contained air. The quantity is sometimes greatly in excess of what is commonly believed, as Professor Hartley states that it has been shown that the bulk of a gravelly soil consists of about one-third air, whilst Pettenkofer says that it varies ordinarily between 3 and 10 per cent., and occupies the space between the stones and the particles of sand. If a cesspool or leaky drain-pipes are placed in this kind of soil, offensive emanations will be given off. These may, especially under variations of temperature and pressure of the air, travel a rather considerable distance, and make their way into houses, especially when the air of a house is raised by fires to a much higher temperature than that of the ground. Dr. Fyffe mentioned an instance where the foul air of a cesspool was drawn a distance of 27 feet into a house. Ground-air must also escape from the soil more quickly when the atmosphere is much warmer than the soil, or when a considerable diminution of barometric pressure suddenly occurs. It is, therefore, important that houses built upon gravel, and especially on made ground, should have the whole of the surface inside the walls covered with six inches of concrete, to prevent the entrance of ground-air. Ground-air consists chiefly of atmospheric air intermixed with carbonic acid, marsh gas, and occasionally sulphuretted hydrogen. If there be any putrefying organic matter in the soil, the ground-air will also be contaminated with injurious gases resembling sewer emanations.

"The ground-air is also displaced by rain, which raises the level of the ground-water, and also causes a rapid escape of air from the interstices of the soil. Winds, by their drying action on the surface of the soil, also assist in producing movements in the ground-air and in the level of ground-water Fevers, cholera, diarrhœa and dysentery are said to be caused by the escape of ground-air into houses."

DISPOSAL OF SEWAGE, ETC.

The care of all the liquid and solid refuse incident to household life, to city nearness of habitation, and to the various trades, factories and industries that necessarily aggregate in close relationship, is and must continue to be one of the most essential requisites to the preservation of health and life. No one is now found so bold as to dispute the causal relations of accumulated filth to some diseases and to general devitalized conditions. While many perplexing and undecided questions may arise, the common consent of observers founded on experience is, that the offalings incident to life must be removed or disposed of in such a way as not to poison the air we breathe, the food we eat, the water we drink, or the surroundings with which we are necessarily brought in contact. If all such material could be for a limited time prevented from any change and stored in the soil ready for the use of vegetable life, or if it could be submitted to ready oxidation or other such chemical or mechanical changes as would render it innocuous, it would certainly be best at once to fulfill these indications. It is not because the ideas of preservation, of utilization, etc., have not been entertained

or experimented upon that they have so rarely been adopted in large cities. It is because there has been found a practical limit to such plausible and reasonable suggestions, either by reason of expensiveness or insuperable difficulties of administration. This does not mean that plans of utilization, or chemical processes of precipitation, or dry removal, or separation or some other methods may not still be operated in certain localities, but it does mean, as a historical fact, that under the most careful advisement and with large experiences of different methods, some plan of removal by means of a sewer system has been constantly gaining in approval for cities of fifty thousand inhabitants or over. The history of the present system of Berlin and the caution with which it was entered upon after trials or consideration of various plans, is but an illustration of an experience that is becoming more and more uniform. Happily there has been a great increase of knowledge both as to the most efficient and least expensive plans. A city that has occasion to consider the question of sewage disposal, should always commit the determination of methods to skilled sanitarians and engineers. The municipal authorities while judging of capacity for expenditure and of the business methods of procedure, must come to feel the choice of method is as foreign to their judgment as would be the construction of a suspension bridge. So long as corporations or individuals sit in judgment on methods and engineering details, instead of submitting said points only to the judgment of their chosen advisers, we shall have plans which lack unity and fitness both in organization and execution. Reference to our former reports will furnish many suggestions to guide in those places where no sewer system has been adopted.

A paper accompanies this report that suggests a method of preventing cesspools from filling up so rapidly. It is a modification of the usual plan of grease trap, by which the grease is retained and the liquid slops and filth are enabled to find more ready access to the ground. Where the usual water level of a city is fifteen to twenty feet below its buildings, cesspools may be available, but in all other cases, they keep the filth too near the subsoil and the people.

OFFENSIVE TRADES AND MANUFACTORIES.

This Board has heretofore drawn the attention of local Boards of Health to the importance of guarding against those nuisances which now so often arise, either from dense smoke or from trades and factories which emit odors in a high degree offensive. Reference may well

be had to page 28 of the first report, and page 13 of the third report. From year to year there is an increasing tendency to locate such establishments in this State, in many cases because New York and Philadelphia authorities will not allow them within city limits. Many of these industries are desirable from a business standpoint, if only they are not allowed to become nuisances. For most of these vapors there are now well-known methods of consumption and of exclusion from the common air. Smoke-consuming apparatus is now so perfect that sanitary authority has recently said that there is no excuse for smoke nuisance. The real difficulty is that most of the apparatus and its care add to the expense. Also the stoker or other person in charge needs to be very vigilant as to his methods and thorough in their use. Such a book as that of Dr. Ballard, of the local Government Board of Great Britain, "As to effluvium nuisances arising in connection with various manufacturing and other branches of industry," as contained in the sixth, seventh and eighth annual reports (1876, Appendix 6, 1877 and 1878,) shows how thoroughly the difficulties have been recognized and met. Over and over again has the question been settled in England and in some of the large cities of this country, that such nuisances are infringements upon personal rights at common law, and must not be tolerated. Many of them are proven to be deleterious to health, but if they were not, if they disturb to a large degree the comfort of the average community, the principle and necessity of the abatement is obvious. It is not enough that the workmen are not destroyed thereby, or that they have acquired toleration of the offensive odors. It is the right of the citizen not to be subjected to such annoyances, when in kind and degree they permanently disturb the comfort of those resident in the vicinity. First of all, Boards of Health should be vigilant in notifying those proposing to start such manufactories or to introduce offensive trades, that they will be held to strict accordance with these views. When complaints are made there should be promptness in attending to them. Generally, the function of a local Board, is not in applying to them the police law of nuisances, such as is necessary in some sudden evil needing very rapid suspension, but to proceed or to unite with others in procuring such injunction or such indictment before grand juries, as shall restrain or abate the nuisance. The common law of this State has usually taken strong position as to this necessity, and not only have injunctions been granted, but as in the Elizabeth nuisance the Chancellor has ordered a special commission of experts with full and speedy powers of jurisdiction and abatement.

Those who thus proceed will find no greater embarrassments than those which attend most forms of litigation, and will be able to prevent or remove many of the evils which in parts of this State have become most obtrusive and offensive.

STATE SANITARY SURVEY AND OBSERVATION.

It is well recognized among sanitarians that the material and layers and adjustments of the earth's surface, its relations to water and soil, its topography and locality, have much to do with the health of those living upon its surface. In addition, they often in certain conditions of health, afford the most intelligent indications for change. In order to promote this kind of observation and the recording of their experience by those best adapted for the purpose, this Board early in the year secured copies of the geological map of New Jersey for 1881, to be used by chosen observers in the study of these conditions. The results of such observations can only be had after a considerable time. The earlier work will be imperfect because it is so difficult to secure close record and analysis. Yet it cannot but be without excellent effect upon the local care of the population, and aid much in directing attention to local causes that appreciate or deteriorate the health of the inhabitants. The effect will be greatly aided by the topographical map of the State, a part of which is already completed. While the geologist and the engineer collect the data and so make them available, it is for us to study these for the welfare of animal life. Questions of drainage, of water-supply, and of weather are intimately associated with telluric or earth conditions. Not less intimately do lung and other diseases depend upon these. By careful study and observation we are thus able to acquaint ourselves with local exposures, and more fitly and pliably to adapt human life and its surroundings to each other.

LOCAL HEALTH BOARDS AND THEIR DUTIES.

The Health Boards of the State vary in efficiency according to the intelligence of the people of the respective districts as to health matters, and the powers conferred upon the Board, and the capacity and tact of the officers who compose them. In the few districts where there is little progress and where the people never inquire into the causes of ill health, and never suspect that the art of right living has

to do with wellness and success, the only thing to do is to let in the light gradually, as you would let in the sunlight on weak eyes, until at length they come to exercise an educated vision and not, like the owl, to regard daylight as a failure simply because not accustomed to it. Such communities are to be dealt with patiently, because their stolidity results from want of knowledge in this particular direction. It is gratifying to know that one after another we find such districts coming to the apprehension of some needs which can only be met by obtaining information. In other cases there is felt need, and Boards which are constituted attempt to do something but fail either from lack of power or lack of pecuniary means. Boards, for instance, like that of Newark, pass ordinances in abundance and enforce some of them mostly because the persons concerned do not see fit to resist or to test the law. These operate only under the old law, never having adopted the laws accepted and adopted by several other cities. Elizabeth, New Brunswick, Trenton, etc., as large cities have called to their aid this more recent legislation, and so are on a par with the townships and smaller cities of the State in their power to enforce ordinances. The law as passed last winter was fully reviewed by able lawyers, and is now such as gives increased powers to those Boards organized under it, of which there are now about two hundred in the State. No case under it has yet been carried to the higher courts. The permanent efficiency of Health Boards and the application of the laws under which they operate will largely depend upon the judiciousness and intelligence of the Board itself, and the ability of the citizens to comprehend the need of their work. Health Boards must always expect that their methods and their acts will be criticised. It is human nature for persons to assume an attitnde of resistance toward any one who questions a man's right to do as he pleases with his private property, or who suggests that it harbors a nuisance. The way to overcome this is to have clear reasons for what is done, to do properly what is to be done, to avoid wasteful expense, and to combine firmness with expediency. Then whatever resistance individuals may offer, a constituency will always be found to claim that a householder has no right to maintain a nuisance to the injury of his neighbor, and that public perils to the public health must not only be removed when existing but prevented when possible.

Some of the more important duties of local Health Boards have already been set forth in the circular of May 10th, 1881, as contained n the fifth report.

It is important that all these Boards should understand both the scope and the limitations of their sphere and of their powers.

Some of them are disposed to advocate the conferment of greater powers upon the State Board, and such as would give it certain local authority.

It has always seemed to this Board that its work should be, so far as local authority is concerned, co-operative and advisory, rather than mandatory. Local Boards should have large local authority, and should be aided by the counsel and influence of the State Board. But local government in such matters is best sustained by popular favor, or, if not, the locality must suffer the consequences. There are certain rare cases in which local neglect may so imperil the citizens of the State at large as to justify plenary power on the part of the State authority, but such instances of jurisdiction should be well defined.

A local Board that does not expect to meet with some opposition and occasionally to be unsuccessful in its efforts, ought to die, just as any man ought to die who expects that radical efforts for good will not be opposed. There ever will be those who, from habit, have becme content with unhealthy conditions and surroundings, and do not know the dangers to health and to life incident to their situation. Others, from prejudice and because these evils have not, as yet, produced a severe visible effect, doubt the opinion of those who advise them, simply because they are unaware of the facts. Others have to struggle for a livelihood and are disturbed at any proposed change, lest it shall entail additional expense as well as toil. All such need to be taught and persuaded, if possible, since their resistance is more their misfortune than their fault. Many such have come to know the sanitary adviser is their best friend, and, by warding off diseases, aids them in comfortable living. A more disturbing class is that which fears to oppose evils because the opposition is unpopular or may interfere with personal aspirations. Yet how many such have come to find that aid to the public health is good policy as well as good propriety. Another class is made up of those who have accumulated property and so oppose improvements in order to avoid taxation. We do not complain that such should narrowly watch their financial interests. But the way to do this is not by opposing what ought to be done, but by guarding against all extravagant expenditure and improving their property by advocating those measures which conduce to the health and the growth of the community in which they dwell. What ought to be done is an expert question, on which most persons

are not competent to sit in judgment, unless they have professionally studied the subject. Their chief office is to see that what is declared to be necessary by those of competent skill, is done with thoroughness and at only such cost as is reasonable. The inertia of ignorance or prejudice is a dead weight, which can only be lifted by proper efforts at information, supplemented by the force of law. Political or pecuniary considerations often give way before the progress of facts. The steady progress which has been made in lowering death-rates in many cities often dispels the objections of popular leaders and of landlords.

A great work can be done by local Boards in acquainting the people with the causes of ill-health, and in providing ways and means for the prevention, as well as for the abatement of nuisances. Systems of local inspection are of very great value. Where a nuisance is contemplated or being arranged for, a Board can often prevent or restrain it. In cases of actual nuisances, not so rapid in their operation as to be suddenly dangerous, the local Board may deem it best to proceed by seeking injunction or by complaint before a grand jury. For some cases this is undoubtedly the most effective method, and needs the action and co-operation of the local Board.

Sanitary law is of two kinds. The abatement of nuisances is fully recognized as belonging to common law, and as to be procured under its provisions.

But as there are cases requiring more summary proceeding, and which would be practically irremediable, either by reason of the great expense or the slower processes of common law, national, State and municipal authorities have recognized the necessity of conferring police powers and summary rights upon sanitary officers. These are not arbitrary, except so far as most summary proceedings are arbitrary. If wrong is done, there is subsequent redress. Quick action is allowed, because a greater wrong to all society is imminent unless such powers are conferred. No laws have a better right to take their place among police measures than some of those relating to sanitary jurisdiction, since no peril can be more serious than such as sometimes invades the public health.

In our own State it was not to be expected that the enactment of new laws conferring such powers, would be without some opposition and even without some difference of judgment on the part of courts. It has taken several years in England, in Massachusetts, in New York, in Michigan and other States, to settle the point that a Board

of Health has the full right to declare what is and what is not a nuisance, and to proceed as if their decision were final. Also, that the judgment of a nuisance in such cases is not of the nature of a trial, and warrants summary proceeding. It is recognized that in our own courts some of these points are yet to be decided. But, in the meantime, there are abundant functions for local Boards to exercise in the interests of the people. Points which are now doubtful will meet their right issue when a sufficient number of litigations have occurred to test decisions. Laws and precedents have growth as well as sciences and arts, and there will yet be decisions inconsistent with former ones, only because the garments which well fitted the childhood of sanitation are not adapted to an increased stature. Special suggestions to local Health Boards will be found in connection with the Summary of the Local Reports.

HEALTH OF OPERATIVES.

The consideration of the influence of trades and occupations upon the health of those engaged in them is very important. It is always to the interest of a State to reduce to a mininum the burdens of the working classes. The oppression of having to live in unhealthy houses, amid foul streets and alleys, without means for the removal of filth, is no slight burden. The man, woman or child who goes to a day's work ought to be protected by law from those taxes upon health and vigor which are not necessarily incident to his or her employment. English law has wisely passed a series of acts known as factory laws, and appointed government inspectors to secure proper protection to operatives. It has besides, made, thorough inquiry into offensive trades and occupations and the modes of remedy or alleviation.

"If a thorough inspection should be made into all our mills and shops, it would be found that the health of many operatives was suffering from working in too crowded rooms and from impure air. It would be found in many quarters that there was a great want of proper ventilation, that in basements or lower floors there is frequently a dampness that is unwholesome; that in some rooms the temperature is too high and in others too low for health; and that in certain kinds or stages of manufacturing, the air is impregnated with steam, vapor, gas or particles of matter that are injurious to health. While it may not be easy to remedy all these evils, yet when the principles of sanitary science become better understood, far greater attention will be paid in every kind and department of manufacturing to those laws, the violation of which impairs health and shortens human life."

Instances of this kind have already been noted by us in hatting and pottery, and are known to exist in glass-blowing, leather and other industries. We are glad to find here and there a factory which has not overlooked these interests, but as a rule there is great defect in methods of ventilation, in regulation of temperature, in caring for dust and floating particles, etc.

STATE-HOUSE.

During the fall a careful examination was made of the sanitary condition of the state-house. The building itself in its location has many advantages, although exposed to some of the evils of soil-pollution and saturation which obtain in the part of Trenton in which it is situated. The basement and cellar portions are guarded by good walls and cemented floors, and there is some effective drainage about the building which either discharges into the sewer pipes or direct into the water-power at the rear. The surface water and the gathering from roofs find exit in the same way.

The heating is by steam, and indirect except for office rooms. Outside air is supplied to the furnace. The air is heated mostly under the first floor and distributed by registers to the building. Part of the year a fan is used to force currents of air over the radiators. An exhaust fan also is used as necessary. Sometimes when rooms are overheated the steam is shut off from the radiators, and cold air passes through the same channels. Hot or cold air can be let under the raised floors of the legislative halls. So far as apparatus is concerned, all hot and cold air is let in from or near the floor, except that in the Assembly room there is also a register about four feet from the floor. A ventilating stack surrounded by heat aids in the inside ventilation.

The basins, water closets and other arrangements for removing soiled liquids or matter of any kind are of various patterns, and the rooms or places in which they are located of various degrees of propriety. The most objectionable is that nearly opposite the room No. 5, on the first floor, which is not well ventilated and has poor closets. Those on the third floor are of similar construction. At least four or five forms of closets are to be found, some of which should be early removed and others ere long be replaced by some form of Hopper closet. Direct and self-operating Hopper closets are used in the basement. Buildings used irregularly, and in which constant and close housekeeping inspection cannot be always fully exercised, generally do better with a form of

closet having little apparatus and no receivers where solid particles can gradually accumulate out of the reach of the flush. When such material is lodged in the pan or valve space, and above the trap, its decomposition will cause odor at each use. Traps are mostly of the usual S variety, or the Adee, and are located near the basins.

The pipes from the various closets are connected with three different main soil pipes conveniently located and running from top to bottom, and so joining the outside sewer pipe, to be emptied into the water-power below the water level.

There is here considerable defect as to ventilation. These cast iron soil pipes do not run out at the roof so as to have air vent there, and have no opening for air at the bottom or in all their course to the water-power. It is now well understood that every main soil pipe should have, besides its outside trap, a ventilating pipe at or near its entrance into a building and another opening on the roof, so as to secure a constant presence of fresh air, which is the best preventive of and neutralizer for sewer gas. Some ventilation is afforded by the entrance of the roof-water leaders into this system, but this is not deemed enough, and especially as it gives no bottom opening, and as during storms these openings become filled and tend to syphon traps. Other minor points have been noted to the officer in charge. It is believed that with a few inexpensive but important changes, the general system as now existing is safe under such efficient oversight as it receives. There is no artificial apparatus or appliance for ventilation in the various rooms and halls, except that the legislative halls have adjustable openings in the ceiling and the gas fixtures are made to aid in ventilation when lighted.

Both the heating and ventilation of the building have been planned with considerable skill, but must depend very much upon administrative care. So little of it is automatic that ill judgment might easily produce draughts and great variation of temperature. The engineer in charge seems fully to comprehend the machinery and its management and to adjust it with skill, as also to appreciate some minor defects. The heating and ventilation, especially of the legislative halls and Supreme Court room, require much judgment. When cold northwest winds prevail the regulation is often difficult.

The water supply is direct from the general water works and satisfactory, except that some of the closets cause unnecessary wastage. There is no fire escape for the upper rooms and no fire extinguisher on the premises.

SANITARY EXHIBIT.

The sanitary exhibit of the present year was the best which has ever been made in this State. It has now been held for four years, in connection with the annual fair at Waverly. It has helped to acquaint our people with various devices for heating, ventilation, sewerage, the care of garbage, and the many other conveniences needed in connection with household life. The same kind of work is now being done by other means. The American Public Health Association is giving its encouragement to a great national exhibit, probably to be held in 1884, under the auspices of the Naval Museum of Hygiene, at Washington. Although the exhibit has involved but small expenditure, it has probably answered its most important purposes, and will not need to be sustained permanently.

The New Jersey Sanitary Association has continued to hold its annual meeting for the presentation and discussion of the various sanitary topics affecting the interests of citizens of the State. In the death of Ashbel Welch, C. E., of Lambertville, and that of Dr. H. A. Hopper, it has lost two of its most active and valued members. While many of the measures it has advocated have received public and legislative attention, it still has a sphere of usefulness. Some abstracts from its most valuable papers will be prepared for the next report.

Several additions have been made to the library, a list of which will be found by reference to the catalogue.

GRAVE-YARDS AND CEMETERIES.

The experiences of the past show the importance of careful consideration in the selection of burial places. The geological structure of the earth, the character of the soil, its water-bearing strata, its slope, and its deep and effective drainage, have much to do with its adaptability. There is great difference in the capacity of ground to dispose of the products of decay. Cases have been brought to our notice where school-houses are located at or very near burial grounds, or where basements of churches, located in among graves, are used for school and meeting purposes. A hot furnace, in such a place, may do much harm.

Burial grounds within cities often become a source of evil. This became so apparent in London that one of the first health efforts was

to get rid of burial grounds, or limit intra-mural interments. As there is a great tendency to form cemetery associations and to select burial sites, there should be some law or some Health Board power by which these selections shall not be made without careful consideration of the interests of the living, and of the future growth of cities. In one county in this state two cemeteries have been reported as causing sickness, as shown by statistics. The Weehawken Cemetery has required legal proceedings on the part of the authorities of Hudson county. A communication as to it on file in this office and accompanied by affidavits, gives series of facts such as show it even now to be a great public peril. There are many cities in which cemeteries should not be located within several miles of the present city. Cities for the dead should be chosen where cities for the living are not likely to come. Where these choices have already been made, much is to be done by way of regulation.

There is also laxity in the reception of bodies by sextons or the keepers of some cemeteries. It should be a law that no burial should take place in any grave-yard of any church or denomination, or in any incorporated cemetery, until a certificate of death or permit has been *shown* as well as procured, and the name of the person buried, the date of the burial, and the name and post-office address of the undertaker or other person in charge, should, at the time, be registered in a book kept for the purpose. Such provisions are not unduly troublesome, and, with the certificate recorded by the State, greatly aid in guarding life and the rights of property. Here and there a county grave-yard has an unknown burial. Such cases are not for the public welfare, and the interests of the State require protection against such occurrences.

The whole subject of the location and management of cemeteries is so vitally related to the interests of the living, and the evils of interments amid close population are so great and so difficult to remedy afterward, that we have deemed it expedient to have, as a part of this report, a thorough article upon the subject. Besides, it will be found to contain much bearing on the origin of pestilences, and on the methods by which the air we breathe is contaminated, and so life is embarrassed or destroyed.

CONTAGIOUS DISEASES OF ANIMALS.

The Board, in its oversight of the contagious diseases of animals, has had the co-operation of the Agricultural Department at Washington in guarding and inspection of cattle arriving from the South, and the assistance of five experienced veterinarians. Much of our effort is in the way of watchfulness and prevention. By correspondence with local Boards of Health, by an early investigation of reported or suspected cases, and by prompt measures in case of the outbreak of disease, we have been able to aid in preventing any wide-spread epidemic. Pleuro-pneumonia has occurred the last year only in the borders of Union and Essex counties, and has extended to but three farms. In one case we found it necessary to secure indictment for breach of quarantine, but in general, instructions are carefully followed out.

The cases in Morris county in a herd of one hundred head, which were under quarantine at our last report, did not extend beyond that herd. Inoculation in that case seemed to check the spread of the disease. Some improvements in method have been recently introduced. We have received the following letter in reference thereto from the most distinguished authority in England, Prof. Geo. Fleming, F. R. C. V. S., of the Royal Veterinary Service: "Inoculation, as a protective measure for bovine contagious pleuro-pneumonia, has been and is now most extensively practiced on the continent of Europe and in this country, and there is no evidence that inoculated animals, while suffering from the immediate effects of the operation, can communicate the disease. There is only one such instance recorded (it is found in my Vet. Sanitary Science and Police), but the circumstances attending it throw great doubts upon its correctness. I, myself, discredit it. I have absolute faith in the effects of the operation, as a prophylactic measure, and would most certainly counsel its adoption when the disease prevails—subject, of course, to suitable precautions as to the time and manner of performing the operation. This should be as carefully attended to as vaccination is with children."

Many cases are reported to us, which, upon investigation, prove to be some other malady. The outbreak of malignant anthrax which occurred in Salem county at the close of last year, did not extend beyond the place at which it occurred. At Secaucus, in Hudson county, there was, in October, a similar outbreak. There have been two outbreaks of the Texas cattle disease in the State—one in Bur-

lington county and one in Salem county. Both were in cattle recently brought into the State and the disease did not extend. In one case of a large herd we found it necessary to kill four cattle. As the meat of cattle affected with this disease is not considered fit for use, cases of the disease need especially to be guarded in the interests of public health. Cattle-owners and dealers should be on their guard against this disease, and newly purchased cattle should not at once be turned in with the general herd unless the full history is known. *Post mortem* examination of these cases is always interesting, not only in its relation to general animal diseases, but also to such as affect human beings. All the more because, by many authors, the inception of this disease is associated with imperfect water-supply and long-continued exposure to a malarial atmosphere. All these comparative studies are attracting more and more attention not only as respects food-supply, but in their analogies and elucidations of human diseases.

The disease of swine known as pneumo-enteritis or hog cholera, has prevailed in three or four localities. It seems persistent as an endemic, and recurs in pens in which it has proved fatal. The directions as to it, in Circular E of this Board, need to be borne in mind. While thus far the execution of the last law as to contagious diseases of animals has not involved much outlay, it is to be remembered that if pleuro-pneumonia or other contagion should occur but in a few valuable herds, it might require considerable outlay to stamp it out. Therefore, too much caution cannot be used by way of prevention. While inoculation to prevent contagious pleuro-pneumonia is recognized as allowable under direction of the Board, it is to be remembered that if not guarded it may become a means of spreading the disease. Any attempts to do this without such surveillance will be promptly dealt with. During the past year the Board has been able to make some arrangements with the New York authorities which remove some of the former embarrassments in transporting milch cows and calves to the New York market, and also to facilitate the transfer of imported cattle to this State for convenient quarantine. Further comments on contagious diseases of animals will be found in Circular F accompanying this report, and in the report of the State Board of Agriculture for this year.

VARIOUS LAWS AS COMMITTED TO THE OVERSIGHT OF THIS BOARD.

The service of the Board in its execution of the general constituting act and in its relation to the Bureau of Vital Statistics and the law as to contagious diseases of animals, is outlined in its appropriate connection as shown by the index.

The change made in the law relating to the adulteration of milk has seemed to work well. The Board is able to commend the efficiency of the inspector. Although it has no relation to the executive administration of the law, it asks and receives a quarterly report of the work attempted. The report of the milk inspector as given with this report will embrace fuller details.

The law to prevent the adulteration of foods and drugs failed of an appropriation last year, only because of a technical defect in the act. The balance left from the former year was small, but has been used with benefit in securing examinations and reports from two of the members of the council of analysts. These will be found valuable as guarding against common adulterations. We believe that it is desirable that this work be permanently sustained by a moderate appropriation. While the State may not deem it advisable to adopt so thorough a system as that of England and of two or three of the American States, there should be a method of apprising our people of the more injurious adulterations of foods and drugs, as these lead to much ill health and impairment of labor power, especially with the families of the industrial classes, who are the greatest purchasers of falsified foods.

The law passed by the last legislature as to the sale of petroleum and its products has been executed in accord with the terms and intent thereof. Its restrictions were made fully known to dealers and to the local Boards of Health. Cases of accident have been carefully watched for and the Board has held itself in readiness to deal with any infringements. The proper apparatus was secured for testing the quality of oils. It is the opinion of dealers as well as our own observation that the law has aided in bringing into disrepute the lower grades of oils, and has protected our citizens from these dangerous impositions. While the law does not secure a paid inspector or enable the Board to sustain a uniform system of detection, it does place into the hands of local Boards of Health the power to prevent illegal sales and to punish those who, as dealers, may cause accidents by the careless vending of forbidden grades.

The law relating to the sanitary inspection of State, county or township alms-houses, asylums, prisons, jails or other public institutions, has been found to authorize an inquiry very important in the interests of the citizens of the State. A special paper on this subject, as a part of this report, will give the details as to the work which has been done. If a plan of State oversight could be devised which would secure a faithful and prudent visitation and advisement, and which would secure to all these institutions the results of more recent knowledge in dealing with the defendant and criminal classes, it would be a wise outlay of time and money. As a rule the State institutions are managed much more intelligently than those of smaller districts.

In accord with the law as passed last year, this Board has urged upon the trustees of the State Normal School the importance of definite instruction in the care of the health of teachers and pupils. Until those who are to have the care of our public schools come to know more about the actual requirements of health administration, and how to guard the physical welfare of those in the schools committed to their care, there will continue to be great lack in this important department of knowledge, among the children and future citizens of the State. Two circulars relating to the subject have been issued, and the Superintendent of Schools has aided us in securing the attention of all district schools thereto. We still hope that a system of definite training and teaching will be adopted by those who have administrative control of the higher educational institutions of the State.

The duty of making inquiry as to such statistical information as is furnished by the national census, in order to make it available for our own semi-decennial census has been performed. We have on file in this office many schedules which will thus be of value as guides to a proper examination.

Various other laws relating to public health have found a place upon our statute books; as these have become known to us we have given to them such direction and influence for good as we could. As a rule, however, laws that relate to public health duties which are passed without any provision for their enforcement, soon cease to be obeyed and so do not accomplish the objects for which they were framed.

The law of last year, (ch. CLV.), more closely defining the powers of local Boards of Health and the mode of procedure where a Board of Health notifies of a nuisance which the owner fails to abate, avoids

some of the constitutional objections which had been made to the modes of exercise of power given under former laws. It is believed that the action of local Boards under this law will be sustained in all cases where no irregularity of procedings occurs.

There is still some need of legislation as to the status of local Boards in their relations to other authorities in the same precincts, to prevent that clash of judgment as to rights of jurisdiction which sometimes occurs.

VACCINATION AND SMALL-POX.

The prevalence of small-pox throughout the United States and its occurrence in various localities in this State during the period included within this report and the previous one, have made it incumbent upon the Board to turn special attention to its prevention, and especially to re-examine all details affecting the methods of vaccination. This was all the more important because of the active discussion which has been going on as to the relative merits of the Jenner or humanized lymph, and that more recently known as the bovine lymph. The later method by which the lymph is propagated from calf to calf and so a supply secured, has led many to enter upon its production as a business. Thus, as never before, the vaccinator has found himself exposed to the risks of unskilled or careless or fraudulent supply. Many other questions have arisen which, although they do not discredit the power of real vaccine lymph to protect against small-pox, require careful statement, and should lead us, in our answers, to indicate how this most efficient and indispensable preventive can be most extensively and successfully applied. In addition to two circulars in our last report, and to many replies and directions to various local Boards, we have sought, from several competent sources, replies to a *Memorandum* of inquiry as to *Vaccination*, as contained in the Fifth Report of this Board, (p. 339), as also such other facts as are especially important to members of the medical profession and to the people at large. Some of the members of the Board have made the subject one of special study and investigation. In addition, we have sought the opinions of several acknowledged authorities, among which we have selected such as seems to us of present service to the citizens of the State.

Dr. T. F. Wood, of Wilmington, North Carolina, has been for many years a close student of the subject, and furnishes brief replies to our memorandum. Dr. E. L. Griffin was one of the earliest prop-

agators of bovine lymph, and by his careful methods, his accurate knowledge and his reliable faithfulness, has done much to test and vindicate the value of genuine bovine lymph. His answers to the memorandum are, therefore, very valuable.

A few additional notes by E. J. Marsh, President of the Paterson Board of Health, form a part of this series of opinions and answers. Answers and a summary by the Secretary also accompany these replies.

It is believed that we thus put on record facts and opinions which will be a safe guide to vaccinators and to the people in seeking the protection of this great preserver from disease, disfigurement or death. While the Board does not endorse the views of each individual, so far as preference or the ground of preference for the kinds of lymph is concerned, it believes that from the material thus presented the best information can be derived.

Information as to the sanitary condition of localities, a summary of such local reports as are of special interest, statements from the milk inspector and from the council of analysts, and other papers containing valuable directions in the interests of public health, are herewith submitted for the guidance of individuals and households, of municipalities and townships, in matters which pertain alike to the welfare of families and of the State.

PAPERS AND REPORTS.

I.—SMALL-POX AND VACCINATION.

BEING IN ANSWER TO THE FOLLOWING MEMORANDUM OF QUESTIONS IN THE FIFTH REPORT:

I. Should the use of bovine lymph supersede the use of humanized lymph?

II. What phenomena, if any, have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph? Such as (*a*) time of maturity; (*b*) degree of sickness; (*c*) proportion of local to general effect; (*d*) as modified by the number of pustules; (*e*) as showing herpes or other skin irritation; (*f*) as to period of protection, etc.

III. Are we able to arrive at any law as to how frequently vaccination should be repeated?

IV. Should there be a law of compulsory vaccination?

V. How far should *revaccination* be insisted upon in attendance at public schools?

VI. How far can we determine the efficacy of the vaccination by the scar?

VII. Should we not adopt the plan of giving certificate of vaccination, so that the facts as to its proper doing may be more fully known?

VIII. In what way shall practitioners be assured of the purity and freshness of lymph?

ANSWER I.

BY THOMAS F. WOOD, M. D., SECRETARY NORTH CAROLINA BOARD OF HEALTH.

"I. Should the use of bovine lymph supersede the use of humanized lymph?"

The employment of bovine lymph at the time it was introduced by Dr. Martin (1870), solved a question which was then becoming momentous—where shall we get reliable vaccine? It averted a disastrous crisis, by returning to the fountain-head for our supply. We need not recount the history of the attempts at the establishment of the practice of animal vaccination; suffice it to say that this regenerated lymph has been sought after by the best practitioners at all times, so as thus practically to admit its validity. Even most of those who were wedded to the Jennerian plan confess the necessity for regeneration.

One of the strongest arguments in favor of animal vaccination is that if it is pursued carefully by skilled and honest propagators, it puts at rest the fear of a vaccine famine, and it keeps the lymph up to the highest attainable degree of activity and purity. It is a fair inference that the purest and most active lymph is the stock from which we must look for the highest degree of protection. It remains now to inquire, is it practically true that bovine lymph is superior to humanized lymph? My answer is in the affirmative.

1. Bovine lymph gives all the results of original vaccinations as described by Jenner, W. Willan and all the earlier writers. It runs its course in the same uniform way, with the exception that the vesicle is a little delayed in its first stage, and the resulting cicatrix corresponds to the oldest record of a typical form.

2. The percentage of successes with bovine lymph (as high as 70 in my experience) in revaccinations of persons originally vaccinated with humanized lymph, demonstrates the superior potency of the former.

3. In the experience of many reliable observers, the course of humanized vaccine through a long series of years, is to depart from its typical form, and therefore afford less and less protection. The history of the practice of vaccination affords us numerous instances of the necessity of reverting to the original stock, to accomplish which retrovaccination, variolation and the discovery of new stock have been eagerly tried. If it were a practical experience in 1836, when the Passy lymph was introduced, and if it were a practical experience during the late war, then we may reasonably look for its recurrence when we depart for a sufficiently long time from the original stock. In this view of the case, resort to bovine lymph makes us sure that we give the person vaccinated the highest degree of protection.

4. There are other practical considerations which should lead us to

discard arm-to-arm vaccinations, when bovine lymph is to be obtained, viz., humanized lymph has been the medium for the transmission of syphilis,* (authority of Mr. Jonathan Hutchison); of erysipelas; of scorbutic ulcers, (authority of Dr. Jos. Jones and Dr. James Bolton, in the Confederate armies.) Bovine lymph is absolutely free from such results. Doubtless the transmission of syphilis is greatly exaggerated, but that it has been done at all, points out a danger that we should take into consideration.

5. Bovine lymph can be procured in any desired quantities, of standard uniform quality, at a reasonable notice.

The reasons in favor of arm-to-arm practice are, for many considerations, sufficiently valid. Up to an unascertained limit, which I may state to be the tenth to the twentieth remove, humanized lymph shows no deterioration. Its effects are milder. It "takes" more rapidly after the inoculation. It is a matter of convenience when bovine lymph is not at hand. It is very seldom that any bad results are detected, such as the transmission of syphilis, &c., from the use of humanized lymph or crusts. It has been almost the sole reliance of the Local Government Board of Great Britain for seventy-five years, and in a country where vaccinations are done faithfully, and show excellent results.

"II. What phenomena, if any, have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph? Such as (*a*) time of maturity; (*b*) degree of sickness; (*c*) proportion of local general effect; (*d*) as modified by the number of pustules; (*e*) as showing herpes or other skin irritation; (*f*) as to period of protection, etc."

Vaccination with bovine lymph has brought to light a series of phenomenal symptoms, except to those medical men who have kept fresh in their minds the descriptions of Jenner and the early writers. Jenner described the disease caused by early removes from the cow, and he, consequently, gave a picture of only the intensest forms of it, in his "Inquiry" and "Further Observations." A glance at the colored engravings in Jenner's great work, in Woodville's, Pearson's, Bryce's, Willan's and all others, shows that the vesicle was larger, and the areola more intensely red than in the cases familiar to us up

* Also contagious porrigo. See Hebra's plates Diseases of Skin; Atlas of the Sydenham Society.

to the time of introduction of Beaugency lymph. The reader of the early vaccinographers can hardly believe there was not some exaggeration in their descriptions of the serious constitutional symptoms, and the bad ulcers which sometimes succeeded vaccination; ulcers so bad, indeed, that they had to be treated with solution of white vitriol.* Pass along until you come to the history of the cultivation of vaccination by Bousquet, (1836), and you will see that his attention was arrested by the opportunity he had of comparing vaccine vesicles cultivated from arm to arm during many successive generations, with the Passy cow-pox, then recently discovered. His pictorial comparison speaks volumes upon the natural history of cow-pox, leading us to the conclusion that vaccine, cultivated from arm to arm, after a certain limit has been obtained dwindles in size of vesicles produced and in the duration of the disease. In fact, showing conclusively that vaccinia introduced into the human subject is in a foreign soil, and will, after a limit, (still unknown), run so low as to require a return to the original seed from the native soil. This is a practical matter, having its analogy in the cultivation of seed in foreign soils. The medical men who were only familiar with this deteriorated vesicle, coming to look upon it as the typical one, very easily conclude that vesicles of bovine lymph are abnormal and unnecessary. And, furthermore, having only in mind the trivial disease caused by an attenuated lymph, they do not put their patients on their guard when vaccinating them with bovine lymph. The consequence is that the patient takes no forethought to protect himself by rest during the fever, or to protect the vesicle from harm.

(*a*) Bovine vesicles mature more slowly than old humanized lymph, dropping the scab from the twenty-fourth to twenty-eighth day. It destroys the cutis vera and leaves a well-marked cicatrix. Decanteleu's beautiful tables of cicatrices show just what we have resulting from bovine vaccinations. We are enabled to go back and examine vaccine cicatrices in the generation immediately succeeding the introduction of vaccination. The foveolation in cicatrices is no more characteristic than the ovoid cicatrix with a convex centre, radiated and with a deep non-foveolated margin. Really, the foveolation accepted by most practitioners as typical, is not a peripheral foveolation, but the depression of the hair follicles scattered over the face of the cicatrix.

* Jenner's "Inquiry."

(*b*) and (*c*) The degree of sickness is generally greater following bovine vaccination. The local effect of the active vaccination is in proportion to the constitutional effects.

(*d*) The number of pustules modifies the constitutional troubles up to a certain point.

The eruptions incident to bovine vaccination are the surest indication of the identity of the present cow-pox stock with the early Gloucestershire stock. One need no longer be surprised to see a general eruption during the course of a typical bovine vaccination, if he will consult Jenner, Willan and other early writers. The defenders of vaccination in its struggle found great difficulty in explaining away the general eruptions produced.

As to *period of protection* from bovine lymph, there is, as yet, no evidence, because a sufficient time has not elapsed to determine. This one fact has been demonstrated, that the proportion of successful re-vaccinations is small in persons who have received bovine vaccination as much as ten years ago; while the 70 per cent. of revaccinations is not unusual among those who had previously received the long-humanized lymph.

"III. Are we able to arrive at any law as to how frequently vaccination should be repeated?"

There is no law absolutely limiting the protective power of a vaccination. It is safe to say, with our present knowledge, that a person vaccinated in infancy with bovine lymph or a short remove from it, and revaccinated at puberty with lymph of equal value to the first, will be secure for a lifetime from small-pox, and, in most instances, from any degree of varioloid.

"IV. Should there be a law of compulsory vaccination?"

It would be well if every person could be compelled to receive vaccination. But it is next to impossible to execute a compulsory law. Our chief work in this direction should be by example, and by informing the people what vaccination really is.

"V. How far should *revaccination* be insisted upon in attendance at public schools?"

Revaccination should be resorted to in all times of public peril

from small-pox, in schools and elsewhere, except in those cases where a fresh and typical scar, together with the history of the patient, satisfies the vaccinator as to the amount of protection.

"VI. How far can we determine the efficacy of the vaccination by the scar?"

The scar, when fresh and typical, is strong evidence of the protection of the subject, although it should be received with some limitation. There are many instances in which the subject has but a faint scar and has absolute protection, as proven by exposure to small-pox. It is the best evidence we now have, and if the vaccinator will carefully study the different scars and keep them in his mind, he certainly, if he can get a true history as to previous vaccination, will seldom make a mistake. Decanteleu's rare chart of vaccine cicatrices ought to be very familiar to every vaccinator.* This was one of the earliest questions discussed. See Steinbrenner's *Traité sur la Vaccine*, p. 658.

"VIII. In what way shall practitioners be assured of the purity and freshness of lymph?"

The evidence of purity of vaccine depends very much upon the knowledge of the subject the propagator possesses and his honesty. In bovine lymph there is no way to determine its purity and freshness except by actual use. As to the estimation of the value of a humanized crust, we can speak with some certainty. A good scab is semi-transparent, mahogany colored, and, when fresh, moist, and when a little older should be brittle. It is odorless, free from blood. It should represent vesicles which have not been tapped. Any departure from the dark mahogany color, especially if the crust be light and friable, should be taken as certain evidence of impurity.

[See in full on this point accompanying note at close of this article, pp. 42–3.]

If hereafter any revulsion should seize the profession in the United States, and they were absolutely to abandon bovine vaccination, the good that has been accomplished will be felt for a quarter of a century, by reason of the excellent stock that has been

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* See Dr. H. A. Martin's report on Animal Vaccination, in the volume of Am. Med. Ass'n Transactions for 1877.

distributed all over the country. In fact, if that day should come, the progressive mildness of the sores and facility with which the lymph would "take," would probably lead the American profession to conclude, as it led the English profession, that animal vaccination is "much less successful than vaccination with humanized lymph." Seaton's Hand-Book, p. 951.

A fragmentary treatise on Vaccine Cicatrices,* published in 1851, now very little known, and, at the time of its publication, but little esteemed apparently, deserves to be studied with renewed interest, as it really contains more information on vaccine cicatrices than can be found elsewhere. Decanteleu had received the appointment of Sanitary Inspector of Schools in 1845, and being perplexed by the meagreness of the current knowledge as to the typical standard of vaccine cicatrices, he set about working out the problem himself. At that time the accepted description was as follows: "The veritable cicatrix is round, depressed below the level of the skin, studded over with depressions of diverse forms, formed by irregularly disposed rays or furrows." Reason and observation demonstrated to him that vaccination could result in cicatrices of numerous and varioloid forms, and very different from those described in the medical works. In order to attain his end he performed a great number of vaccinations, studying with care the results, determining rigorously their character, and finally studying with scrupulous attention the mode of formation of the succeeding cicatrices. During seven consecutive years he pursued this investigation, watching, recording, and taking impressions of five thousand four hundred and twelve vaccine cicatrices.

In order to make his work more complete, impressions were made with pasteboard paste and glazier's putty. In this way he procured a rich and curious collection. From these moulds were engraved one hundred and twelve figures. In order to make it more complete, a second column was added to his table of figures, placing the cicatrices of ecthyma, burns, leech-bites, small-pox, furuncles, carbuncle, acne, blisters and cauteries, side by side with the vaccine cicatrices.

The first part of the work comprehends the following heads: 1, the form; 2, their dimensions; 3, the configuration of their surface,

* "Monographie des Cicatrices de la Vaccine, accompagné d'un tableau i'conographique, contenant 112 figures disposeés méthodiquement," par J. E. B. Denarp Decanteleu: Paris 1851, p. 32.

the accidents noticed, their color, their characters, their nomenclature; 4, their affinities; 5, their differential characters; 6, their classification; 7, their diverse transformation; 8, the degradation of their forms or types; 9, the degradation of type in the same subject; 10, co-existence of the different kinds in the same individual; 11, the relative frequence of divers kinds on the same subject; 12, the influence of age, constitution, weight, texture of skin, certain skin diseases, on the aspect, dimensions, accidents and color of the cicatrices.

The second part considered: 1, why some vaccine cicatrices are round, some oval; why, in the oval form, the long axis is parallel with the axis of the arm; 2, the diverse dimensions, and on the same subject; 3, the varied configuration of their surface, the punctated and the *figured** (gaufrure); 4, why the recent cicatrices are generally concave, and how they can undergo divers and numerous changes; 5, cause of the degradation of forms in different individuals and the same individuals; 6, how cicatrices of different types can exist in the same persons; 7, in what manner age, constitution, corpulency, texture of skin, skin diseases, influence the type, aspect, dimensions and color of vaccine cicatrices.

In the 5412 cicatrices examined, 3493, or 65 per cent., or nearly two-thirds, were round; 1919, or 35 per cent., little more than one-third, were oval.

It was also observed that these two forms could exist separately or together. Thus, on 1000 subjects, 47.5 per cent., nearly one-half, presented only round cicatrices; 190, or 19 per cent., had oval cicatrices only; and 335, or 33.5 per cent., a little more than a third, presented a mixture of the two forms, combined in very variable proportions.

DIMENSIONS OF VACCINE CICATRICES.

The dimensions of round cicatrices vary from 4 to 20 millimetres, ($^3/_{20}$ths to about $^{15}/_{20}$ths inch.) The greatest number (1136) measured 7 millimetres, (about ¼ inch) in diameter; and the next greatest number (795) measured 6 millimetres, (little less than ¼ inch); and the smallest number measured 20 millimetres, (more than ¾ inch.)

* Gauffrure—having irregular cellules on the surface, like the markings in a waffle. There seems to be no exact word.

REMARKS.

A critical study of Decanteleu's figures of cicatrices, leads to the conclusion that, industrious as he was, his work was incomplete. Some casts in my possession from some cicatrices found in the persons of German subjects, resulting from vaccinations of thirty years ago, show that there is a valuable number of varieties left entirely out. These are round, with clean-cut borders, ⅛ inch in diameter, depressed, whiter than the surrounding skin, but distinctly foveolated. This I believe to be typical of a vigorous humanized lymph, several generations removed.

The convex cicatrices are very numerous after animal vaccinations, and many of the forms he gives are now common. They must have been rare in this country when this work was written, (1845), and their frequency can be accounted for by the discovery of several cases of cow-pox, from which their stock was drawn; the Passy case, in 1836, being the one nearest this date, just nine years before his studies were commenced.

ANSWER II.

BY EZRA M. HUNT, M. D., SECRETARY NEW JERSEY STATE BOARD OF HEALTH.

It is not the design of this article to debate the question whether small-pox has been limited and prevented, and is to continue to be limited and prevented, by vaccination. The fact that Edward Jenner discovered a system of introducing what is known as the kine or cow-pox will be taken for granted. In 1798 he published his "Inquiry into the causes and effects of variola vaccine," and about 1800 Dr. Waterhouse, of Boston, procured vaccine lymph direct from Jenner. Ever since, vaccination has been practiced in this country.

As to the power of vaccination in influencing small-pox, we quote from "The Truth about Vaccination," by Ernest Hart of London, (1880), and refer those anxious for more details to this brief treatise:

"Eighty years' use of vaccination has proved beyond doubt that, 'duly and efficiently performed,' its power of influencing small-pox is, indeed, almost absolute, that it acts, not invariably by preventing, but sometimes only by controlling that disease. The vast majority of those who have gone regularly through the vaccine

process are saved thereby from any future attack, however modified or slight, of small-pox. In the minority, who have not been rendered by it completely proof against the influence of the small-pox poison, the action of that virus is yet so modified that the small-pox, as a rule, is deprived of all danger to life, and does not leave behind it those disfiguring traces which are not the least of the terrors of unmodified variola. There is certainly no subject on which medical testimony is more unanimous than on the very large immunity from attacks of small-pox which successful vaccination will confer. A vast body of evidence which was collected by the Epidemiological Society in 1851-52, from all parts of the kingdom and from abroad, showed that vaccinated persons placed in circumstances in which no unvaccinated or otherwise unprotected person, or scarcely any such, escaped (*e. g.*, persons living in crowded and ill-ventilated dwellings in which the small-pox infection existed, occupying the same rooms, and sleeping in the same bed with small-pox cases, mothers nursing their babies who were suffering from the disease,) yet remained themselves entirely unscathed."

Taking it, therefore, for granted that there is such a thing as protection from small-pox, by the process known as *vaccination*, our first practical inquiry is, *from whence is the material for the operation to be secured?*

To this three answers have been given, each of them so correct, that probably the preference must turn upon relative points and questions of expediency.

The lymph used by Jenner, and which was the means of introducing the art of vaccination to the world, was derived from an eruptive disorder found on the udder of the cow, which, after painstaking research, he learned to distinguish from other eruptive diseases also sometimes found on the udder. He found by actual experiment that when the lymph was introduced into a child, it was preventive of small-pox.

He also found that it was not necessary always to procure the lymph direct from the cow, but that in passing through human subjects it did not lose its power. Hence came the use of "humanized vaccine lymph," which, it is abundantly proved, in the course of eighty years or more has protected tens of thousands of persons from the small-pox.

The second source from which effective vaccine lymph has been derived, is such as has resulted from the introduction of the virus of variola or small-pox into animals and then using the modified lymph of the vesicles so produced for human vaccination. No doubt the fact that Jenner himself regarded the kine or cow-pox ("variolæ vaccinæ") as a modified small-pox, first led to this class of experiments. It is true that this source of supply has been doubted, because of many negative experiments, but the evidence of Gassner, Sonderland (1830), Thiele (1836), Robert Ceeley, of Aylesbury, Mr. Badcock, of Brighton, and their acceptance by such authorities as Simon, Seaton, Buchanan,

etc., the successful repetition of Ceeley's experiments in this country, in 1840, by Dr. Horatio Adams, of Waltham, Mass., by Dr. S. Knight and Dr. Wm. C. Van Bibber, of Baltimore, (1852), and the fact of the continuously successful use of vaccine derived from such sources for a long time afterward, seems to leave no reasonable doubt that, if need be, a fresh vaccine lymph can be thus secured. As, however, there could be no advantage from an attempt to secure vaccine lymph from such a source at this time, and as some risks similar to the former risks of inoculation might attend it, it only seems interesting to us as starting the question whether, after all, the alleged cases of spontaneous kine or cow-pox had not a human origin.

The third source from which effective vaccine lymph has been derived, is from a case of spontaneous cow-pox known as the Beaugency stock (1866), lymph from which, propagated from calf to calf, was introduced into this country in 1870, as also possibly from some other stocks of spontaneous cow-pox which have been authenticated. (We do not include in our enumeration a vaccinating lymph which was procured by introducing humanized vaccine lymph into calves, and so an attempt made to refresh by this culture, and which was known as Lenoix's lymph, and for a time used with some success.)

Practically, as we now have to deal with vaccination, the only question to be determined is, shall we insist upon using lymph known as the Jenner lymph, transmitted by successive human vaccinations, or shall we use the lymph from more recent cases of spontaneous cow-pox, cultivated or preserved by being transmitted from calf to calf, instead of from person to person? (After having compared these two, a subsidiary question also arises, viz., whether we shall in all cases use this more recent lymph transmitted from calf to calf, or whether, having this supply, we shall not select our best results in children, and so use also humanized lymph of this more recent stock.)

1st. As to the Jenner lymph.

The criticisms made upon its use relate chiefly to these three points:

(*a*) Its enfeeblement of protective power by reason of its long use and so distant remove from the original supply.

(*b*) The possibility of conveying thereby some disease which has existed in persons from whom the lymph has been taken.

(*c*) The difficulty of obtaining enough to meet the emergencies of epidemics.

Under the first point (*a*) the statement of the case is this: It is alleged by some that you may take the lymph from a normal vesicle,

at the proper time and in the right way, and insert it into the flesh of unvaccinated persons and have an apparently good vesicle therefrom, but that of one hundred or more so vaccinated, more than in the early years of vaccination will contract genuine or modified small-pox not very long after, and still more will be protected for a shorter period than formerly.

The strongest statement made in confirmation of this view is probably that furnished by Dr. Cameron, of Dublin, and to be found in the Fortnightly Review, May, 1881.

In all such examinations it is to be borne in mind that even if the fact seems to be established, we are first to inquire whether it is not owing to some incidental or accidental modification of effect, and are not to assume that it is owing to any inherent deterioration of "vesicle" power. If so, and if we are able to eliminate these restricting or disturbing results, it does not at all affect the integrity or usefulness of the original methods. The errors made in the adoption of a system do not at all affect its real value, if only these errors are capable of identification and removal. The art of the physician is to recognize the errors and their sources, and to secure that precision of procurement and insertion which shall insure success.

After some careful examination of the subject, we are unable to collect any series of facts which show that in the oft-repeated removes from the first vaccinations in Jenner's time, or in that of his immediate successors, there was apparent any change in the character of the vesicle, so far as concerns its efficiency. Even oftener than now, the test was made by the direct exposure of vaccinated persons to the contagion of small-pox. Ever since, physicians and nurses without number have relied upon this protection without any consideration of the number of removes from the original stock, and have had the proof which such a test furnishes, that this vaccination is fully protective against small-pox.

With so much evidence as there is on which to postulate a law that genuine vaccination of this kind is protective from small-pox, where a case of apparent exception has occurred, such questions as these are in order:

Was the vesicle from which the lymph was taken a genuine vaccine vesicle, and the lymph in a proper state for transfer?

Were all the usual phenomena of a perfect vaccination realized in the case of the person under observation?

Was the vaccination that of a single vesicle and without any appa-

rent constitutional impression, so as to raise the point of defective quantity rather than of deteriorated quality?

Have such cases been so rare as to make it legitimate to class this as an idiosyncrasy, since we recognize that to many laws there are occasional inexplicable exceptions which do not invalidate the general law?

These questions are started here not with the intent of their full answer, but as a caution that when careful and continuous observation and testimony seem to have authenticated a law, we are not to give such force to a few phenomenal or apparent limitations as to lead us to doubt its existence. Imperfections in details do not mar the primal fact. It generally occurs that these failures or variations are capable of explanation, and that there is no need to discredit the written judgment of those who have formulated the law, and by the fullest observation established it.

The fact that some persons have contracted small-pox after having had it once before, does not at all affect the general statement that one attack of small-pox is protective against a second. With the many possibilities that arise as to the genuineness and extent of a vaccinating effect, it is not surprising that some persons who have been vaccinated have an after-attack of small-pox or varioloid, yet the fact remains that, as a rule, the Jenner vaccination is fully protective against small-pox. Such is the belief of a very large majority of vaccinators.

PERMANENCY OF EFFECT.

Our second inquiry has reference to the question whether there has been any diminution in the time in which genuine vaccination affords protection.

If vaccinia is a modified variola, or even if not, and if any of the analogies, as measles, scarlatina and others of the class of diseases to which small-pox seems to belong, apply to it, it would be proper to entertain, as a working hypothesis, the idea that a vaccination which, at the time, exhibits its full effect, would continue to be operative throughout the whole of the subsequent life. The fact that in very many persons it has been and is so operative, can scarcely be gainsaid, and adds to the probability that the protection is usually lifelong.

If sufficient exceptions multiply upon us, we are not at once to conclude that the law must be set aside, but are to start and settle such inquiries as these:

Is there full and sufficient evidence that the original vaccination was such, in all particulars, as would have satisfied Mr. Jenner and the earlier disciples of vaccination?

Was it at all tested at the time by what was formerly so much the crucial method of immediate revaccination, to know whether the system failed to respond to a repetition?

Is it certain that when we get what seems to be a true vesicle from a repetition with bovine lymph, that the person was not protected or that what you may choose to assume was a feeble protection, would not have prevented his taking of the small-pox?

Is it certain that the sore produced is a genuine vaccine vesicle, and uninfluenced by anything that has preceded it? Or, if undoubtedly genuine, can we not ascertain a law of change in the individual or in his climate or surroundings, that accounts for the effect and recognizes him rather as an explicable exception than as a breach of the law and a reason for its denial?

Such inquiries behoove the accurate students of the subject who are seeking to be exact, and who form judgment upon sufficient testimony rather than upon the bias of their own few cases.

For, when we come to turn back to old authorities and see the precisions and tests of original vaccination, and the sources of error that we may need to eliminate, we must not too hastily conclude that there is *usually* a limitation of effect, or that revaccination under the same conditions as those of its early performance is required at briefer intervals than in the time of Jenner. There is a strange lack of such evidence as would commend itself to a medical judge and jury, if all of us were called upon to submit our cases to such a decision, and to give a reason for our views with meekness and fear.

We believe that Jenner was right when he said of vaccination: "Duly and efficiently performed, it will protect the constitution from subsequent attacks of small-pox as much as that disease itself will. I never expected it would do more, and it will not, I believe, do less." Seaton's Hand-Book, p. 178.

II. The second point of possible objection is the possibility of transmitting by or through vaccination any disease which has existed in persons from whom the lymph has been taken.

That by some condition of the person vaccinated some form of irritation may occur, or that eczema or other skin disease may be developed has always been granted. But results have been in thousands of instances so benign, and the protection from small-pox so complete,

that there are but two diseases as to which impression enough has been made to take the form of serious objection.

These are erysipelas and syphilis. The occurrence of erysipelas has never been claimed as peculiar to vaccination. Any scratch upon the body may be the occasion of an erysipelatous disease, or the introduction of parts of a crust or of some irritating foreign matter, distinct from lymph, may produce it. The probabilities or possibilities arising from this disease have been very carefully studied, and a full analysis of cases has never authenticated this disease as a valid reason for neglecting this protection from small-pox. It is a very rare result.

Most physicians do not believe it possible to communicate hereditary syphilis by genuine lymph. The grounds for suspicion in this direction have been so doubtful that a large majority of vaccinators still doubt if cases of alleged syphilis have not been the result of the accidental introduction of syphilitic poison, by the direct application of the virus to the puncture or abrasion, or afterward by rubbing or scratching. The general view has led to this form of statement:

1st. While syphilis is an inoculable disease, it is probably only inoculable by its own primary infection, which the child could not have, except as the syphilitic virus was introduced directly from the parent or some other source by direct contact.

2d. It is not known that inherited syphilis can be communicated through vaccination. If it could be, inasmuch as inherited syphilis is a disease, the existence of which is declared within six months after birth, this remote possibility could be vacated by choosing a supply from children of an age beyond that time.

"In foreign countries attempts have again and again been made to decide by experiments whether vaccination, from persons obviously ill from constitutional syphilis, will communicate syphilis to the recipient; and it is, to say the least, a very remarkable fact that in not one of these experiments has anything like syphilis resulted. With the well-attested experiments which now stand on record we are obliged to doubt whether vaccination, *i. e., genuine and simple inoculation with vaccine lymph,* from however syphilitic a subject, can possibly communicate syphilis, or, at the very least, whether some stage of the vaccine vesicle more advanced than vaccination rules allow to be proper for lymph supply, or some admixture of blood with vaccine lymph such as careful vaccination never permits, must not be a condition for such possibility." See Hart, p. 291. "During the twenty years in which there has been systematic inspection of public vaccination in England,

some millions of vaccinations have been performed. But in no single instance have the government inspectors of vaccination been able, after the most rigid inquiry, to find one single case of syphilis after vaccination." Hart, p. 27. Is not Dr. Seaton correct in saying *that the danger*, if indeed there be any at all, of communicating through vaccine lymph, as in an ordinary well-performed vaccination, any other infection than its own must be so infinitesimally small, that for all practical purposes we may regard it as non-existent?

Our third query relates to the difficulty of obtaining enough Jenner lymph to meet the emergencies of recurring cases of small-pox. This certainly has become a serious inconvenience. With the exception of the supply from Dr. C. H. Leonard, of Providence, Rhode Island, which Dr. E. M. Snow of that city has been so careful to perpetuate, it is now quite difficult in this country to be sure of a supply from the Jenner stock. While we cannot accept many of the objections made to the Jenner lymph, and believe by perfect care and propagation it would continue to protect, even if we never had discerned the method of perpetuating calf or bovine lymph, yet when we come to examine still further we shall hope to show some reasons why, at the present day, it is as practicable as it is safe for us to trust chiefly to the bovine supply, and to concentrate our efforts in preserving it from those unskilled and commercial embarrassments to which it is exposed.

We therefore next pass to inquire whether the lymph now especially known as bovine lymph, is reliable, as carrying out the intent and accomplishing the purpose of the Jenner system of vaccination, and how its completest effectiveness is to be secured.

While it must be admitted at the start that the use of the recent animal lymph has not yet been very long or been subjected to the accuracy of experiment which has been exercised as to the Jenner lymph, there is no reason to doubt its great value as an addition to our sources of supply. It vacates any cavil as to the possibility of the transmission of human diseases, which has been alleged as to the humanized lymph, and enables us to secure a larger amount of supply, fresh and ready for use. On the other hand, the very fact of large demand and active production sometimes begets carelessness as to methods, or passes its production and sale into the hands of those who have no expert relation to those nice experimental questions which greatly concern the physician and his patients. While we do not admit the necessity of its use by reason of the loss of any original power in the Jenner lymph, we regard it as an addition to our stock

of such advantage as now to be regarded as our most important supply.

We have thus answered the first inquiry in the memorandum of this Board, as found on page 339 of its fifth report.

In answer to the second inquiry of the memorandum, as to the phenomena which have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph, we note as follows:

(*a*) The time of maturity is less uniform and generally more prolonged. Dr. Wenning, for instance, of the Cincinnati Academy of Medicine, (see Cincinnati Lancet and Clinic, 1882, p. 113,) vaccinated on the same day in the same school, about forty children with bovine and eight with humanized lymph. Some of the bovine lymph did not produce its effect until the fourteenth day, while the human took in the usual time. Dr. Hewitt, of Minnesota, informs me that during an epidemic in his state the contrast was so marked that in the cases of those who had been exposed to contagion he uniformly used the humanized lymph, in order to anticipate the prodromal stage of small-pox. In the Privy Council report of 1854, under a page headed "Signs of Successful Vaccination and of Successful Revaccination," being the description of Gregory, as revised by Ceeley and Marson, it is said "when lymph is employed which has recently been derived from the cow, the resulting phenomena, as compared with the previous description, are somewhat retarded in their course; and the areola is apt to be much more diffuse. There is, also, more feverishness but eruption is less frequently seen." P. 12.

(*b*) The degree of sickness is, as a rule, greater in a genuine bovine than in a humanized vaccination, and quite corresponds to Jenner's statement, made as to his own cases. This, when arising from perfect lymph, is regarded by many as a proof that the constitutional effect is more pronounced. If it were possible always to know that this sickness results from the pure lymph alone, and was not modified by the condition of the system or from other causes, the amount of sickness would be a test of the constitutional effect. As it is, the experience or judgment of the vaccinator must be relied upon to determine its exact significance.

(*c*) *The proportion of local to general effect.* It is not probable that recent bovine lymph has anything peculiar to itself as distinct from the Jenner lymph, so far as the relations of local to general effect are

concerned. The local effect, as well as the constitutional, is regarded as likely to be more pronounced in the use of the bovine lymph, but this probably depends somewhat on the amount of lymph introduced, as we shall see under another heading.

(*d*) "*As modified by the number of pustules.*" We are still in need of statistics on this point sufficiently accurate to be comparable with those already on record as to humanized or Jenner lymph. (See English Reports for 1861, by Drs. Seaton, Stevens, Sanderson and Buchanan.)

As a sample of the importance attached to this, we find that under the English vaccination method, the registrars kept record of the number of marks. Thus Dr. Seaton, in his report for a half year, (June to December, 1860,) has the following in his return:

With typical marks, 2882,	3 or more,	1036.
	2 " "	1219.
	1 " "	627.
With possible marks, 3485,	3 " "	1262.
	2 " "	1447.
	1 " "	776.
With bad marks, 1889,	3 " "	606.
	1 " 2	1283.

In the next report (1861), after an additional examination of over 19,000 cicatrices, he says: "The conclusion that 29 per cent. of children nominally vaccinated were very imperfectly protected against small-pox, and that another 37 per cent. had only a comparatively moderate degree of protection, is a very serious one, and would be still more serious if it had appeared to depend upon causes beyond control." Having only one or two marks was called by some the "half-vaccinating" custom. Care was formerly taken to have the insertions about three-quarters of an inch apart, so as to distinguish the vesicles from each other.

There can be no question that in the use of the Jenner vaccine it was important to produce more than one pustule, and that both the degree and permanency of the effect had some relation to the number of vesicles or pustules which filled with lymph. Often punctures used to be made sufficiently apart from each other to give opportunity to trace the development of each one. It was and still is the general judgment of the medical profession that a number of pustules is desirable, because more fully assuring the degree and permanency of protection. It is objected by some in respect to bovine lymph, inas-

much as its effect is more active than that of Jenner lymph, that the introduction of a larger quantity makes the operation itself more hazardous. It is a question of much importance whether we ought not to adopt what used to be known as the Bryce method, from the plan of Mr. Bryce, who, soon after Jenner's discovery, introduced vaccination into Scotland. So soon as the activity of a single insertion or puncture had been manifested, he revaccinated at another point. If, in due time, this showed some effect, he repeated it again, and so on until no effect was apparent. It was a fact that when the second or third vaccinations produced an effect, the latter insertions, which came to anything, matured nearly "consentaneously" with the first that had taken.

Dr. E. Warloment, Director of the State Vaccinal Institution at Brussels, and perhaps the most successful practitioner of animal vaccination, says: "When a child is brought back at the expiration of the first seven days, if it be revaccinated on the spot, even with its own vaccine lymph, it may be that there will be a fresh eruption, feeble for the most part, but occasionally showing all the signs of classic vaccinal pustule. What conclusion is to be drawn, if not that the first inoculation, insufficient to protect the subject against a second vaccinal impregnation, was *a fortiori* insufficient to guard it against variola? Hence the necessity of fresh insertions until the complete exhaustion of vaccinal receptivity. This is what I term *vaccinization*. Thus every child brought back at the end of eight days should be revaccinated on the spot, even with its own vaccine, if it be in proper condition. If this second vaccination answer well, a third should be performed, and so on, till the patient be completely *vaccinized*. I have a decided conviction that if this practice were followed, if all children were *vaccinized*, the immunity from small-pox would be much greater than at the present time; and it is, perhaps, from my having constantly put it into practice that my successes have been so constant, and the result of my vaccinations so thoroughly satisfactory."

Because it is not always easy to determine the genuineness of a bovine vaccination, because we do not perfectly know how far a local effect indicates a complete constitutional effect, we think it would be a valuable addition to present methods of practice if it were usual to repeat vaccination in a few days, even where what seems an adequate effect has been produced. Nevertheless, there is little doubt that a single vaccination, properly performed with bovine lymph, does, with

rare exceptions, protect the person who has been vaccinated from small-pox.

(*e*) *As showing herpes or other skin irritation.* It is not generally claimed or admitted that bovine lymph of the more recent stocks and transmitted from calf to calf, is any more likely to produce dangerous irritation than is the Jenner lymph. Like the original cow lymph, as used by Jenner, it is more active in its effects, and therefore is more liable to excite local irritation, and to be the occasion for the appearance of some eruptive disorders, to which the person may be inclined. Whatever danger there may be of the conveyance of any human disease from one human system to another, is avoided in the use of bovine lymph. It has never been alleged that any serious disease has been transmitted from the bovine to the human species. Although from the fact that some dermatologists believe that a mild form of herpes has been thus transmitted, students of bovine vaccination should be on the watch against the remote possibility. In reference to the "nævus-like" looking proliferation which sometimes is formed, Dr. J. B. Taylor, Inspector of Vaccination for the New York City Board of Health, speaks thus, (see Med. Rec., April 8th, 1882, p. 389): "It is virus beginning to deteriorate that produces the 'raspberry,' or, as they are more commonly called, fungus or abortive vesicles. The latter are cellular in structure, closely resembling a vaccine vesicle in all appearances, except as to color. This is a dark or dirty red, like a nævus. They appear a little later than a true vaccination and remain unchanged for from two to four weeks, when they dry up, forming a brown scab, which eventually falls off, *leaving no scar.*" We cannot say with the author that they cause no inconvenience. We think they are keloid in their character and need further investigation as to their cause. While they never have been found harmful, they are unpleasant, and of no value as a protection; from the fact that one observer has reported a large number of cases as occurring from the use of one stock of lymph, it seems to be not at all connected with any individual condition, but with some condition of the lymph used.

(*f*) *As to period of protection.* We see no reason to doubt the statement of Ernest Hart, that "by vaccination in infancy, if thoroughly well performed and successful, most people are completely insured for their whole lifetime against an attack of small-pox; and in the proportionately few cases where the protection is less complete, small-pox, if it be caught, will generally be, in consequence of the vaccination, so

mild a disease as not to threaten death or disfigurement. * * * In consequence of the large amount of *imperfect* vaccination which has until very recent years existed, the population contains very many persons who, though nominally vaccinated and believing themselves to be protected against small-pox, are really liable to infection." * *

We believe that a summary of evidence as to the Jenner vaccination goes to show that, as a rule, where persons were properly vaccinated with the genuine lymph, and to a degree that showed constitutional effect, as tested by repeated vaccination before the first vaccination had separated its crust, such persons were permanently protected from small-pox. Also, so far as present evidence goes as to bovine lymph, it is equally strong, or, as some would claim, much stronger. This prepares us to pass to the answer of the third query of the memorandum—"III. Are we able to arrive at any law as to how frequently vaccination should be repeated?" Our answer to this is, if we were able to know that the first vaccination was performed by a skillful person, and found satisfactory by him, and especially if tested by revaccination at the time, we believe, in the vast majority of cases, the protection is permanent. Jenner, in his day, gave a case to show that some perceptible effect from lymph inserted long after does not prove that the person would have contracted small-pox. Arriving at the age of puberty, or change of climate or of constitution, does not again subject a child who has had measles or scarlet fever to a new attack.

We believe that Jenner was correet in his claim that a child fully and properly vaccinated was for life protected from small-pox as perfectly as if he had once had the disease, and that the same is as fully true of genuine bovine lymph as procured by transmission from calf to calf.

But the *practical question as to the necessity of revaccination is quite different from the theoretical one.*

Whether from imperfect vaccination at the time, imperfection of lymph, imperfection of skill in the vaccinator, or of care in observation, the neglect or impracticability of repetition at the time, or from some other possible cause, it must be admitted that the common judgment and consent of the medical profession at present is that revaccination should be had at or about the age of manhood or womanhood, and that in the presence of an epidemic or special exposure, it is the part of proper precaution to repeat it. Personally we base this view only on the judgment that since we do not, in most cases, know all

the details as to protection, it is not worth while to run even a minimum of risk of so serious a disease as small-pox. But we are not able to arrive at any "law" as to how frequently vaccination should be repeated.

IV. We do not at present favor a general law of compulsory vaccination, because we believe the object sought can in this state be attained better in other ways, taking it for granted that a primary vaccination is always insisted upon. As children are those of the most susceptible age, and in their mode of aggregation at school, furnish the most hazardous materials for epidemics, and as the privileges of the school are the gift of the state, it is wise and proper to require of teachers and scholars vaccination as a condition of attendance.

V. How far should revaccination be insisted upon in attendance at public schools? is the fifth question of our memorandum. This depends largely upon the period which has elapsed since the first vaccination, the evidence of its genuineness, and the intensity of the epidemic, or the degree of exposure in particular cases. Where the vaccinator or the source of the lymph are unknown, or there is want of evidence as to degree of protection, revaccination is generally to be advised as safer. But whether a child who has not been or will not be revaccinated, shall be excluded from the school, must be left to the judgment of physicians and to the action of local boards of education or school trustees.

Revaccination is to be urged chiefly on the ground that the first vaccination may not have been exhaustive, and that in the presence of an epidemic it is not worth while to run any risk.

VI. How far can we determine the efficacy of the vaccination by the scar?

In general this may be answered by saying that the efficacy of a vaccination largely depends upon its quantity and quality, and that the scar as examined by an accurate observer informs much as to these.

When we review the large amount of evidence furnished by Jenner and his contemporaries, and examine the records of the English Blue Books and the consentient views of such observers as Marson, Ceely, Seaton, Sanderson, Simon, Stevens and Buchanan, it is surprising how far attention to these items has ceased to be exact.

In 1863 Dr. Seaton begins his report by saying: "We begin by assuming, as now proved beyond shadow of doubt, that the number

and typical quality of vaccine scars are the elements which denote efficiency of protection against small-pox. Without waiting for the new evidence of this relation that will presently appear, we assume that every vaccination should be performed according to the rule of the council which directs at least four good-sized vesicles, or an equal amount of local effect to be produced. From the above tables it is seen that not more than one hundred and eighty children in one thousand had the high degree of protection that would be given by an obedience to this rule. Even if we admit their good cicatrices as constituting evidence of efficient protection, we find that scarcely more than a third part of the whole number of vaccinated children have received this degree of protection.

It is to be remembered that in all the earlier methods of vaccination, separate and successive punctures were made, and there was great accuracy of observation as to both the extent and quality of the result. The principles of test were well enunciated, after observations of tens of thousands of cases by various observers who found themselves in full agreement as to what did and what did not, both as to quantity and quality, constitutes the sign of proper vaccination. The opinions were formed by examination of the cases about the eighth day, as well as by examination of the cicatrices. Thus in the first instructions of the first report of the medical officer of the Privy Council, (1858), instruction third is, "vaccinate by four or five separate punctures, so as to produce four or five separate good-sized vesicles; or, if you vaccinate otherwise than by separate punctures, take care to produce local effects equal to those just mentioned." It was then largely the custom to have the child from whom the lymph was taken present, for immediate transfer, in the spirit of a letter of Jenner's written to a friend whose children he was asked to vaccinate, where he says, "Our arrangements must be carefully made, as the children must be met here by proper subjects for transferring the lymph, for on the accuracy of this part of the process much depends.'

The facts presented by Mr. Marson, in his report of 1856, after having been in charge of the London Small-pox Hospital for nearly twenty-five years, and the views of Mr. Ceely, of Aylesbury, both pointed to the necessity of close distinction between perfect and incomplete vaccination. Dr. Simon, emphasizing the importance of both (p. 54) the amount and the character of the mark, says: "The amount of vaccination scar or scars on the arm or arms of a successfully-vaccinated person ought decidedly not to be less than half, and is proba-

bly the better for reaching three-quarters of a square inch. It does not practically matter whether the quantity is got by the existence of one very large scar or by the existence of several smaller ones—a difference which depends on inessential differences in the mode of vaccinating." Mr. Marson's method is to make, about three-quarters of an inch apart, five punctures, not very superficial, each of which gives a vesicle, and eventually a cicatrix of circular form and of diameter varying from three-eighths to five-eighths of an inch. Mr. Ceely, using Weir's vaccinator, at four different spots, about three-quarters of an inch asunder, raises on each spot a compound vesicle or group of vesicles; and the result at each spot is a cicatrix of oval or elliptical shape, and on average about one-half of an inch long, by one-third of an inch broad.

"The quality of vaccination scar, to which too much importance cannot be attached, is that it shall be slightly depressed, and in its whole extent be dotted over with minute pittings." We do not agree with Martin in depreciating the import of these. One cannot read the description of the sizes of a successful vaccination as given by Gregory, and revised by Ceely and Marson, without seeing that in it they expressed that accurate knowledge which came from the closest observation of thousands of cases. Still, more, the four inquiries of the medical officers of the Privy Council, made by eminent men and including actual examination of cicatrices by the hundred thousand, as detailed in these reports, show that the number and quality of the "marks" is, to the skilled observer, quite accurately indicative of the value of the protection.

It is hard to rid one's self of the persuasion that the need of revaccination of the present day is mostly to be attributed to the uncertain character of some of the lymph, to the want of thoroughness in primary vaccinations, to the want of skill in judging of the requisite quantity and quality of the "sore," and "the vaccinator's low standard of what he ought to deem a satisfactory result of vaccination."

As the present habit of vaccination is not by distinct punctures, we need to judge more by the area of the cicatrix and by its indentation, (foveolation.)

Dr. Russell, the health officer of Glasgow, says: "The number of vaccine marks can have no meaning, excepting so far as they indicate, in a general way, the quantity of lymph introduced into the system. * * * I am inclined to think that the local and permanent phenomena which would best indicate the quantity of lymph introduced,

and, consequently, show even more striking relations to the mortality, would be the superficial area of good vaccine cicatrices."

An area of half a square inch is the size specified in the official report of Dr. Bridges.

It must be admitted that in dealing with bovine lymph we have not, as yet, determined, with the accuracy with which observers of the Jenner lymph thought they had determined, the significance of the cicatrix.

The small annular elevation of the lymph cells and the friable character of the crust, often perplex those who have, over and over again, seen so as to be sure that they know what has constituted a good Jenner vaccination.

From the variable depth and circumference of the vaccinal lesion even when uncomplicated, and its variation from local inflammation, both the area and the "foveolation" or pittings are obscured as to their significance. The graphic and accurate descriptions of the Jenner vaccination by Gregory, Ceely, Marson and Wilson, deserve to be recalled. (See English report, 1858, p. 30.)

It is true Dr. Martin is both positive and descriptive in his identification, but this perhaps, because of our mixed supply, is too accurate to correspond with the testimony of most observers.

While greatly hopeful over the evidence to be secured by more extended comparisons, and while not denying to the cicatrix some significancy, we must, at present, say that it is doubtful whether, from the cicatrix of a bovine vaccination, we can certify the perfection of the protection. Vaccinators should be studying cicatrices.

VII. *Certificate of vaccination.* We think the plan of a certificate of vaccination important. It identifies the time of the operation and the person performing it as can be done in no other way. This would often determine the question of protection or the need of repetition. It secures greater carefulness on the part of many vaccinators. England now has government medical inspectors, and certain of the medical licensing bodies require evidence of tuition by one of the government teachers of vaccination.

A certificate of vaccination should state the number of vesicles produced. At present there is no definition of what is a successful bovine vaccination, too often any sort of vaccinal effect on the arm being regarded as a success. The certificate should give the time and place of its performance and by whom, and should state whether the lymph used was that of the Jenner stock, that from the calf direct or that

which is one or more removes therefrom; as also whether a crust or points have been used. All the better if the source of supply is also stated.

VIII. Our next question is: "In what way shall practitioners be assured of the purity and freshness of the lymph?"

The importance of being thus assured cannot be overestimated.

If the lymph is simply inert, repetition is required, and a want of confidence engendered. If small-pox is prevalent the first failure may expose the person and so the community to an attack of small-pox, which good lymph would have prevented.

If, besides the lymph, you have blood, serum or other foreign matter, or any organic substance in a process of decomposition or decay, there is the possibility of producing much unnecessary local irritation, and of introducing into a human system material which may excite disease. Also if a dirty lancet is used.

The possibility of obtaining unprotective or absolutely spurious and injurious lymph, does not weaken the argument for *vaccination, since there is such a thing as thoroughly protective vaccination*, since the material for it can be procured, since *what it protects from is one of the severest* scôurges of humanity, a fearful tax on human life and on social and national progress.

But the fact of possible inertness or spuriousness does make it intensely incumbent upon the general government and the State to secure for its citizens right vaccination, to protect them from imperfect or spurious vaccination, and upon the members of the medical profession to see to it that in offering themselves as vaccinators, they be able to assure their patrons that they have a lymph which is both safe and effectual, in a timely and protective sense. For on these two conditions, one of which relates to the State and the other to the vaccinator, depend a very great public and personal interest to citizens, to families and to individuals. And it also behooves the vaccinator to know that both as to quality and quantity of effect, he has given to his patient the full benefit of the *completest* and longest possible protection.

It thus becomes a practical question, both to physicians and the people generally, how we shall have assured protection. Many physicians, feeling the importance and responsibility of the question, think that the general government should have a system which should insure against imperfect lymph. Others, that the State should in some way provide a lymph supply.

It has not been deemed advisable by this Board for it to enter upon any system of lymph production. It acquaints itself with and advises as to sources. Then also it sees to it that vaccination is promoted throughout the State, and that it is promptly resorted to when small-pox occurs. It has been able to aid much in this way.

In the case of the only vaccine farm in this State, it was found to be conducted by a city Board not in the limits of the State, and we could only make examination and pass judgment and give advice. It had objections and has now ceased to exist. In order to have a more assured certainty of lymph we have encouraged physicians to use that which has taken satisfactorily to themselves and is thus approved by their own selection.

We have also introduced into the State certain approved stocks of lymph, and placed them for propagation in the hands of responsible and capable physicians, as thus starting local centres of purity, to which we could refer and which we could authenticate.

When asked as to how the people shall know that the lymph is pure, we can only answer by saying that their confidence must rest upon the vaccinator, and is the same they exercise when they send for a physician and trust him that he will use the proper medicine and not make a mistake as to it. To assure its purity or to give the right remedy may cost him far more inquiry in the one case than in the other. But so long as there is the genuine article; so long as it is an indispensable requisite to protect us from a sad and disfiguring and often fatal disease, and so long as a skilled profession have both motive and competency to secure the protection, the reliance must be here. If finding a lack of ability to secure the needed protection, they must, through the people and in their behalf, appeal to the State.

For this we do not apprehend any present need. The two past years have witnessed a prevalence of small-pox, and an epidemic intensity very general in its character. No State has been more exposed thereto than our own. While it has broken out in fifty or more localities, it has in only three instances obtained much headway. In these its progress was mostly owing to neglect of adequate powers in local Boards, but was readily met when such powers were conferred.

The enormous demands for vaccine lymph throughout the country found the reputable producers of bovine lymph unable to meet the demand. Hence we have been exposed to the evils of an over-demand, which, in such an instance, could not but lead to unskillful or fraudulent production. With this experience, with increased knowledge and

with the great awakening of the medical mind, it is probable that the true and reliable sources of vaccine lymph will be more closely defined than ever before. Questions of preference as to methods and of the significance of lesions or changes wrought by the lymph, and of the conditions which limit or secure permanency of protection, will be examined with eager skill. If for the sake of brevity we may commend to others what we would say to ourselves, it is thus:

Do not forsake the Jenner lymph, on the ground that it has lost protective power.

Do not discredit bovine lymph because there has been occasional over-production and fraud.

In our zeal for the old or the new, let us not create a public feeling of distrust in this protection. Remember that there are enough reliable producers to make it competent for you to assure yourself of the reliability of your lymph. Do not let its supply take the form of a mercantile drug, since it is a commodity so special in its character as to need to be supplied more directly.

Watch closely the course of your vaccinations, and, to some extent, *depend upon yourself for supply by using lymph* that you procure after having obtained your original lymph from a reliable source, inserting it in a healthy child and having been satisfied with its mode of action.

Do not use crusts, except in a most pressing emergency.

During an epidemic, with persons who have been directly exposed to small-pox, use, if you can, at first Jenner lymph, on the ground of its greater rapidity of action, even if soon after, at some other point, you introduce the bovine lymph in order to test or intensify the effect.

Let us not allow the mere incidents or accidents connected with the use of either Jenner or bovine lymph to obscure the indispensable importance of vaccination or of protection from small-pox, the hazard from which is actually so great, while that from vaccination is infinitesimally small.

As a summary of the views submitted as a whole in this paper, we may add as follows:

SUMMARY AS TO SMALL-POX AND VACCINATION.

I. Small-pox, after complete vaccination, is as rare a disease as is a second attack of small-pox in the same person.

II. Where a vaccination has not afforded protection it may be owing

(*a*) to the lymph being spurious, or (*b*) deteriorated in quality, or (*c*) insufficient in the degree of saturation of the system, or (*d*) owing to some idiosyncrasy in the person. If owing to any of these causes, these cannot be said to establish any rule that limits the effects of proper and complete vaccination, since such causes admit of elimination or limitation to a minimum.

III. The protection afforded by vaccination depends much upon the fact that at the time of its performance it has been done so exhaustively as that weekly or bi-weekly repetitions with genuine lymph would not produce any effect.

IV. Revaccination at adult life is often but the supplementing of partial or inadequate vaccination in youth. The chief argument for it is the fact that present methods of first vaccination do not encourage repetition at the time. Revaccination is a wise precaution.

V. So long as there is no compulsory law of vaccination, and no system of certificate as to the perfection of primary vaccinations, revaccination is all the more important.

VI. Lymph from spontaneous cow-pox is, probably, not deteriorated from the mere fact of human transmission, and, therefore, that usually known as the Jenner lymph is still valuable.

VII. Lymph from more recent spontaneous cow-pox, transmitted through successive calves instead of through successive infants, is also a valuable source of supply. This may be used after transmission through persons who have not been previously vaccinated.

VIII. The risk of transmitting other diseases through vaccination is excessively small—is even considered impossible by many of the best authorities. Yet the time will never come when dirty methods of collecting or inserting lymph, or when the careless introduction of other material into the original sore may not transmit septic or irritating material, or when any scratch may not, in a very small fraction of exceptional cases, cause inflammatory or septic results. Such rare and avoidable accidents or neglect furnish no reason for neglect of a process which, for every risk it has occasioned, has saved tens of thousands of lives. The expectation of life to each individual is therefore increased by vaccination.

IX. The security against small-pox consists in the exact knowledge and care of medical men, in the performance of the operation only by competent persons, and in such general laws as favor or secure the purity of lymph and the prevalence of vaccination among children.

X. The only reason why small-pox ever becomes an endemic or an epidemic, is the neglect of complete vaccination.

ANSWER III.

E. L. GRIFFIN, M. D., PRESIDENT OF WISCONSIN BOARD OF HEALTH.

I. "Should the use of bovine lymph supersede the use of humanized lymph?"

Not necessarily so; perhaps not wisely so. Both are protective, indispensable, and, with wise safeguards in their selection and use, safe.

We would urgently recommend the use of humanized lymph of only a few removes from the heifer, when that form is used. When such a selection is made, the relative merits of animal and humanized lymph cannot be fully determined by any data we have at command.

We regard bovine lymph as possessing all the qualities of safety and protection which could be desired. The essential requisite in the use of either is a conscientious and intelligent care in their selection and use.

II. "What phenomena, if any, have occurred in the use of bovine lymph, as distinct from what has been heretofore noted as to the humanized Jenner lymph?"

(*a*) *As to variation in time of evolutions and maturity.* The period of incubation is from one to three days, generally, longer in the use of bovine lymph than where humanized lymph is used.

A relatively long period is generally observed before the vesicle reaches its several stages of development and maturity.

Retardation in the course of the vaccination is a matter of common observation. This peculiarity is generally thought to be caused by the insoluble quality of bovine albumen in the serum of the blood, and hence the slow action of the absorbents on the vaccinal granule. This delay is so marked in some cases as to cause great surprise, but I have never known any untoward results to follow. The same phenomena and from the same cause are sometimes observed where humanized crust is used. Generally, in the end the vesicle matures fairly, and we may reasonably infer that a protective influence has been secured.

The phenomena of successful vaccinations will present marked deviations in degree when observed in different individuals. The cause of this is to be looked for in the variations in the quality and vigor of the lymph used; in the varying conditions of health in the persons vaccinated; in their unsanitary surroundings and in mechanical interference with the normal development of the vesicle.

(*b*) *Degree of sickness.* The constitutional symptoms following the use of pure bovine lymph, and those induced by lymph humanized by a few removes from the heifer, are generally of a like character and degree. In the case of both, these symptoms are sometimes quite severe. The cause is quite often found in the condition of the patient himself. It must be admitted that during the past year an unusual amount of severe constitutional symptoms and local complications have followed the use of bovine lymph. Undoubtedly several causes have combined to produce these results—

1. A marked susceptibility, during a portion of the year, in the human subject, to the vaccinal disease, as well as to the variolous poison.
2. The use of bovine lymph of questionable purity.
3. The use of points which were packed and sent out for use, possibly before they were thoroughly dried. In such cases, some vital degenerative change might take place in the albuminous coating of the point, so that when such lymph was planted in the human arm a degree of septic action might be set up. Where orders were in advance of the crop, and impatiently waited for, such an accident is by no means impossible. All these evils are *accidental* and almost inseparable from a great pressure, such as was brought to bear upon all vaccine establishments during the winter of '81 and '82.
4. Faulty and unskillful methods of vaccinating, especially the one of scarifying too deep.

Simple as is the operation of vaccination, yet it requires a degree of technical skill rarely appreciated in or out of the profession. It is to be deplored that an operation so inseparably connected with the safety of human life should be entrusted to any but skilled hands.

(*c*) *As showing abnormal results.* The frequency of vaccinal erythema following the use of bovine lymph is a noticeable phenomenon. This constitutional manifestation of the vaccinal disease is seldom observed in the use of humanized lymph of distant removes from the heifer. It is a harmless affair, and only indicates a thorough saturation of the system with the vaccinal disease.

The phenomena of so-called spurious vaccinations are sometimes very annoying. The prevalent notion that these irregularities appear only after the use of bovine lymph is incorrect, for they were observed years before the introduction of animal vaccination.

While an apparently large number of spurious vaccinations were observed during the winter of '81 and '82, it must be remembered that the ratio was small, since the number vaccinated was simply immense, and this without regard to physical condition or sanitary surroundings, and that the service was rendered in many cases without skill or intelligence such as the importance of the operation demands.

A recent writer * has grouped together what may be called the *accidents* sometimes noticed to follow the use of bovine lymph, having their cause, as we have before stated, sometimes in the patient and his surroundings, and sometimes in the bad quality of the lymph used.

1. Red tubercles, the size of peas, appear at the seat of vaccination. These tubercles sometimes suppurate.

2. The vesicle commences with much itching and irritation. It is not umbilicated, but acuminated or conoidal, and contains straw-colored or opaque, instead of clear lymph. The areola is completed by the fifth or sixth day, and begins to decline on the eighth day, the scab falling off by the tenth day.

3. Instead of the usual papule or vesicle, a bulla containing a transparent fluid, and having a reddened margin, may develop. Troublesome ulceration sometimes arises beneath the crust, which is formed after the rupture of the blebs.

4. A crop of herpetic vesicles, preceded by shivering, may appear about the third day after vaccination. These soon burst, and the exuded fluid gives rise to an eczematous eruption, the skin becoming hard and œdematous. Intolerable itching accompanies the vesicle, and the axillary glands become enlarged.

5. Occasionally vesicles which have apparently run a normal course up to the eighth or tenth day, suddenly rupture, and ulcers, that spread both superficially and deeply, make their appearance. They cause pain or itching, and are accompanied by much constitutional disturbance.

These manifestations are always benign in character, and always end in complete recovery.

(*d*) *As to period of protection.* This cannot be definitely settled by

* Hardaway on Vaccination and Small-pox.

our present *data*. The history of animal vaccination is too brief to furnish opportunity for strict comparison. The evidence is strongly in favor of bovine lymph over that of humanized, *i. e.*, the long-used human lymph.

III. "Are we able to arrive at any law as to how frequently vaccination should be repeated?"

No. That must always, from the very nature of the case, be a matter of experiment. So much must be allowed in a given case for the varying vigor of the lymph used, for the possible imperfection of the operation, for the accidents interrupting the normal development of the vesicle, and for the varying degree of resusceptibility to the vaccinal disease, that nothing but repeated trials can test the safety of any person.

The test of revaccination should be applied at the age of ten or twelve years, and before that age under imminent danger. The trouble and cost of such a revaccination is so insignificant in comparison with the security gained, that it is one of the marvels of the age that so many neglect this duty.

IV. "Should there be a law of compulsory vaccination?"

We are not prepared to advocate such a law, although there are potential arguments in its favor. The partial application of such a law as applied to schools and public institutions is wise. In the present state of the public mind with regard to compulsory measures, it is very doubtful whether a more general law of a compulsory nature would be sustained. Educate the people as to personal duty and public obligation, and leave the burden of responsibility on the individual.

V. "How far should revaccination be insisted upon in attendance upon public schools?"

Undoubtedly to the extent of full protection for all the pupils. It could not be considered an unwise or objectionable rule to revaccinate all pupils when arriving at the age of twelve years. It might be found necessary to revaccinate younger pupils during a wide diffusion of small-pox in the community.

All doubtful primary vaccinations should be revaccinated. The genuineness of a primary vaccination must be determined by its history; by the appearance of the scar as to its typical or deficient character; by its quantity.

VI. "How far can we determine the efficacy of the vaccination by the scar?"

Only approximately. We need another factor to aid us, namely, the history of the primary vaccination. While much reliance can be placed upon a truly typical scar, together with a reliable history, giving a typical primary vaccination, we are obliged, in the final analysis, to fall back upon the test of revaccination to establish and assure our judgment.

VII. "Should we not adopt the plan of giving certificates of vaccination, so that the facts as to its proper doing may be fully known?"

Yes.

VIII. "In what way shall practitioners be assured of the freshness and purity of the lymph?"

If humanized lymph is desired, the physician must make his own selection and be his own judge. It is a wise way to procure a package of points of bovine lymph from some reliable propagator, and on carefully-selected children produce vesicles from which, on the seventh or eighth day, lymph may be taken of perfect purity and great activity.

In the matter of bovine lymph, great responsibility must always rest upon the propagator. No man should be allowed to propagate animal lymph for public use who is not a well-educated physician, of accredited and unimpeached integrity of character, and who conscientiously devotes himself to this service.

The perfect quality of animal lymph is a matter of so much importance to the public that its production should not be degraded to the level of a common trade, but be exalted to a sacred position in skilled labor. All vaccine establishments should be under the State or national supervision, thus giving, in a measure, a guaranty to the public.

No one can positively determine the purity and vigor of animal lymph by its physical properties. Some of the finest quality of bovine lymph is *amber*-colored. Some has a tint as if stained with blood. If such points are very heavily charged they have a suspicious look.

We make the following suggestions:

1. Purchase your lymph from some well-known, accredited and experienced propagator.
2. Order direct from the producer.
3. Order only in such quantities as will probably be used early.
4. Use dry-stored lymph upon ivory points or quill slips. Animal crusts are too unreliable and too liable to contain impurities to be recommended.

5. Vaccinate but one person with one point.

6. Do not carry the points about in the vest pocket. Body heat soon lowers the vitality of the lymph.

7. Reject such points as have evidence of containing impurity.

8. Study carefully your *methods* of vaccinating and seek to become skillful in the operation. Take time. Be patient. It pays.

Recognizing the infinite blessing of animal vaccine, it should be the constant effort of every physician to seek to reform such evils as are incidental to it and extend its practical usefulness to the human family.

ANSWER IV.

BY E. J. MARSH, M. D., PRESIDENT OF THE BOARD OF HEALTH OF PATERSON.

In compliance with your request, I will give you my opinion and the results of my experience on the various questions propounded on page 339 of the report of the Board for 1881, concerning vaccine lymph and vaccination. The first two questions can best be discussed in the reverse order, as the answer to the former will follow from the answers to the latter.

I. From the beginning of my practice up to 1873, I had used the humanized vaccine lymph exclusively. I had employed the arm-to-arm method, the fluid lymph in capillary tubes, the quills and the dried crusts—the last in a very large majority of the cases. The lymph was obtained either by myself or some professional friend, or from some institution of known character, as the New York Dispensary. I had seen two or three epidemics of small-pox. During these small-pox epidemics I was perfectly satisfied with the protective power afforded by this vaccine, (I mean in cases of recent vaccination), and I felt perfect confidence in my ability to protect any individual who might be exposed to the disease. I had seen no serious bad effects from vaccination; there had been a few sore arms—small, indolent ulcers, slow in cicatrizing, a few cases of subsequent eczema, and a few of convulsions in teething children. Moreover, the success of the operation had been good, failures in primary cases were very rare, and more than half the secondary vaccinations were successful. Since 1873 I have used almost entirely the bovine lymph, and this has been

obtained from Dr. F. P. Foster, Dr. H. A. Martin, or the New York City Board of Health. I began and have continued the use of this lymph for various reasons; the danger of conveying syphilis by vaccination had been much written about—a possible degeneration of the Jennerian stock and consequent diminution of the length of the protection conferred by it had been asserted, and it became a fashion to use the animal lymph and patients asked for it. In my use of bovine lymph it was observed that the vaccine vesicle resulting was much larger, the areola and inflammatory induration were more extensive, the crust large, flat and thin, generally ruptured, and came away before the sore was cicatrized. In two instances the inflammatory action was so high that the vesicle sloughed out *en masse*, leaving a deep ulcer. The constitutional symptoms were not more severe than formerly. There was a little more frequent delay in the maturity of the vesicle, but this was not generally marked. There was no more tendency to subsequent eruptions or irritations of the skin, but yet the only case of post-vaccinal erysipelas I have ever seen came after the use of bovine lymph; but this, in my opinion, is in no way attributable to the character of the lymph, but solely the result of the traumatism.

The operative success was not nearly so good as with the use of humanized lymph, and at one time failures even in primary cases seemed to be the rule and successes the exception. So much so, that I often felt and expressed a dread of dealing with another epidemic of small-pox. I felt I could not anticipate or promise my patients the same certainty of success and immediate protection as formerly. I desire to say, however, that recently my success has been much greater on account of adopting a rule of vaccinating with two points in every case, and now I have obtained very excellent results, one of the two abrasions almost always producing the vesicle. This unequal success is due, in my opinion, to the dilution of the vaccine lymph; the humanized lymph used is generally the pure lymph from the vesicle, or the same, dried in the crust; the substance on the quills or points of bovine lymph consists mainly of blood serum, with a very small quantity of vaccine lymph. As to which kind of lymph will protect the individual for the longer time, must be left for the future to decide. The time that has elapsed since the introduction of the animal lymph has been too short to allow of any decision in its favor, or to determine whether a single vaccination, in infancy, with this lymph will protect for a lifetime. For myself, I certainly would not take the responsibility of not advising a revaccination on reaching

adult age. As bearing on this subject, I will report that I recently revaccinated a child of seven and a half years whom I had previously successfully vaccinated in early infancy with animal lymph, and this revaccination was successful.

In accordance with my own experience given above, I find no reason why the bovine lymph should supersede the humanized, and I find many reasons why both should be retained.

Bovine lymph should certainly be retained; the protection it affords is certain, the absence of syphilitic contagion is certain, and on this account it can be used in some cases where prejudice would interfere with the use of the best humanized lymph. The most decided advantage it affords, however, is the ease with which the supply can be forced equal to any possible demands. With the sudden appearance of small-pox there is at once an enormous demand for vaccination, and the supply of vaccine is strained to the utmost and often falls short. By cultivating the lymph on cows and heifers, however, a supply can be obtained at a week's notice equal to any possible demand.

Humanized lymph should be retained, because it is protective from small-pox, because, with care, it can be guaranteed as equally safe as regards danger of syphilis, because it can be propagated by the physician himself, and because of its *comparative cheapness*. The last may seem an insignificant point, but it is not so. In some parts of the State the fee for vaccination is ridiculously low, and a physician who receives only fifty cents can scarcely afford to pay from ten to thirty cents for his material.

As to the way in which practitioners can be assured of the purity or freshness of the lymph: In the case of humanized lymph, it had best be propagated by themselves or obtained from physicians on whom they can rely. Bovine lymph cannot be thus obtained, but the supply can only be kept up by organized work. The procuring at all times an abundant and reliable supply of vaccine is of sufficient importance to be taken charge of by the State. This can be done either directly or indirectly. A vaccine farm can be carried on by the State Board of Health, or the same Board can officially inspect and certify to the character of the lymph supplied by individuals. This must not be all, however. This would provide good material, but it would not keep out the bad. No other lymph ought to be allowed to be sold or used in the State, except such as might be authorized by this Board.

We may not be able to arrive at any absolute law as to how frequently vaccination should be repeated, but we can, at any rate, establish a reasonable rule of practice. In ordinary periods it is neither necessary nor advisable to revaccinate before the period of adult life—about twenty years—but the operation should then be performed, and such vaccination and revaccination will almost certainly protect during the whole period of life. In times of small-pox epidemics, the revaccination should not be postponed beyond the age of ten years, and adults, who may have been revaccinated once successfully, should be advised, though not urged, to a second revaccination, partly to provide for the few exceptional cases and partly to redouble their own assurance of protection. Therefore I do not believe that *revaccination* should be insisted upon in attendance upon public schools. In ordinary cases the children are too young to be proper subjects for revaccination, and in times of small-pox epidemic, the local Boards of Health can enforce the necessary rules as to such attendance. Possibly it might be advisable to require successful revaccination as a necessary qualification for graduation.

Nor do I believe that there should be a law of compulsory vaccination. The enforcement of such a law would be very difficult in this country, on account of the slight police surveillance and the migratory habits of the people. Very few persons object to vaccination, and an equal amount of labor in offering vaccination would bring equally good results. Under the two systems, London suffers more from small-pox than New York. As a means of preventing small-pox, it would be totally inadequate unless it provided for thorough revaccination. I see no benefit to be derived from the giving of certificates of vaccination. The possible value of such a certificate would depend upon the ability and character of the physician signing it, and, in too many instances, would be worthless. In all instances of primary vaccinations (with very few exceptions), it would be of no more value than that certificate which is always given—I mean the scar. This may not be of positive value as to the protection afforded after a period of years, but it is of as much value as any written certificate could be. Certificates of revaccination might be of value in certain exceptional cases, where the resulting scar was small or indistinct.

DISPOSAL OF SEWAGE IN CITIES.

BY JULIUS W. ADAMS, C. E.

Having been honored by the request to furnish a paper upon the subject of the disposal of sewage in cities, I am led to confine myself to a review of the several schemes or systems which have been proposed to that end, as any attempt to illustrate the practical details of sewer construction would be somewhat unprofitable, unless given in connection with the systems in localities to which they severally related. This would carry us further than our limited space will permit. I have accordingly confined myself to an exposition of the several systems of sewering towns, in which, of course, there will be much which to engineers will lack the flavor of novelty—but I trust that the cause in which we are all interested, will not suffer by any attempt to bring the principles of the several systems clearly before the citizens of this state.

In the diversity of opinions which prevail as to the value of the several systems, the circumstances under which they grew up have an important bearing, and their history, going back a long way, for many centuries in some cases, is not uninteresting, and I had attempted to relieve the dryness of the subject by a rehearsal of some of these matters, which, after all, have but little practical value, and are inconsistent with my main purpose of *condensation*. I shall therefore omit their recital, and confine myself rather to what *is*, as of more practical importance than how it came about.

The end and object of works of sewerage are to remove the liquid and semi-liquid waste products of life from the vicinity of dwellings, before decomposition sets in, and in such manner that there cannot possibly be any harmful pollution arising therefrom, either to earth, air or water, and that the operation of removal shall give no offence to either sight or smell, and no methods be asked of the people, which

are likely to be neglected by the most refined, or by the lowest or most improvident of the population. Such is the ideal sewerage to which we aim to approximate; and that system or method which will, all things considered, promises the nearest approximation to this standard, in a given locality, is the proper scheme to be recommended.

The above standard presents the primary sanitary needs, which admit of the least possible compromise. The secondary and economical considerations, the value of which each community must judge for itself, are, theoretically, that the organic wastes present in sewage should be returned to the earth from whence they came, to be remoulded into vegetable life for future animal use. Science points unmistakably to the need of this economy, the neglect of which has heretofore impoverished large districts.

While science indicates that these organic wastes should be utilized to enrich the soil, it by no means follows that each and every locality should strive to this end. It may be that its accomplishment would cost more than its return money value, in which case the waste of these fertilizing elements, (when effected without endangering any sanitary principle), may be considered as so much expended to insure the public health. *Salus populi suprema lex.*

It must be borne in mind, however, that while we speak of the sewering of a district, the proper disposal of the rainfall on its surface, as well as the subsoil water, is no less important in a sanitary point of view. The surface water which scours the gutters and cleanses the streets of paved cities, except in the event of long-continued storms, is shown by analysis to differ in no essential from sewage, and requires equal facilities for its prompt removal. Stagnant water is the enemy of human life, and a water-logged soil is found to be one of the most potent causes of phthisis, as shown by the result of subsoil drainage in some English towns; hence the consideration of its proper disposal, as well as the removal of surface water and filth, cannot with safety be neglected when considering the sanitary needs of populous districts.

It will appear that there are *three* systems for the collection and removal of sewage from the neighborhood of dwellings. Each system comprises several methods:

First, the dry system. This divides itself into the general method, whereby the human fæces, without other liquid than that peculiar to the material itself, is alone dealt with. *Second*, the pneumatic system, where the house sewage alone is moved in hermetically-sealed iron

pipes to the outfall, by the method of a vacuum in the pipes or by compressed air, as the case may be. *Third*, the water-carriage system, where, by one method, the house sewage alone is conveyed to the outfall; and by another method, sewage of all kinds, from whatever source, including storm waters, are led to the outfall by the action of running water.

The methods under the first system comprise the midden-heap, privy vault, ash closet, dry earth closet and the equally barbarous or semi-barbarous method of pails, tubs, etc., or any plan, indeed by which the material is left for any length of time on the premises, and when removed is finally disposed of by hand or the horse and cart. The emptying of cesspools as ordinarily practiced, though not exactly a dry method, may yet be classed with the above.

Some of the methods of this system are still largely in use, even in large cities in Europe, and are not unknown in our own country, but are suitable only for isolated dwellings, farm-houses or small settlements, where the open air of the surroundings reduces the nuisance inseparable from their use, to a minimum. Removal by "pails" can scarcely be called a system, as not reducible to rules, but as one of the methods very much spoken of at present, it may possibly claim recognition as such.

The advocates of the pail method will urge its economy, and state in evidence its large and growing use in England, where the need of better sanitary conditions have forced themselves upon the attention of the authorities to a greater extent than elsewhere. In the towns of Rochdale, England, with a population of over seventy thousand, Manchester, with six hundred thousand, and Birmingham, with four hundred thousand, four-fifths of the people use the pail method, and it is on the increase in the crowded manufacturing districts of the north of England. The State Board of Health of New York, (second annual report, 1882,) have recommended its use for villages and towns without sewerage works, in our own country, as entirely inoffensive in its operation, and shows the economy of its use by stating "that the yearly expense of removing human sewage in Rochdale was but ten cents per head of the population," &c.

To this it might be answered that the recommendations of the New York State Board of Health, if carefully examined, will be found to be confined *exclusively* to such small settlements "as are without a public water supply or system of sewerage." But the citing of the method of Manchester, Rochdale and large cities among a wealthy, highly

refined and cultivated people, in such commendatory terms as "*inoffensive* and economical," and the urging its adoption as a sanitary measure has tended to fortify the belief in many minds that irrespective of the local circumstances which have forced the pail method into use elsewhere, (and which circumstances do not obtain in this country,) the fact of its use for many years in such crowded cities with satisfactory results, may be considered as evidence that it could not fail to be a desirable and safe method for *any* town or city in this country to adopt, whatever the character or extent of the population. Such views, though based upon an entire misapprehension, are prevailing to such an extent that in the interest of true sanitation I feel constrained to devote more space to a consideration of this pail method than at first sight, before this audience perhaps, would appear necessary.

In Manchester alone, with a population on both sides of the river of six hundred thousand, we are told there are no less than sixty thousand of these closets; in Birminghan nearly as many, three hundred thousand of the population in the latter city being furnished with them. They consist usually of a closet in the back of the premises, abutting upon, and accessible from a back alley, which alley serves for two rows of houses, one on either side. An iron pail of a capacity of about ten or twelve gallons is placed under the seat of the closet, provided with a cinder-sifter, through which the fine ash falls below, and the cinders into a recess, for further use in the household. The pails are removed by the town authorities at least weekly, and the pails emptied in extensive yards. The pails are cleansed and returned, and the excreta, together with refuse from slaughter-houses and other sources, and from the streets, are by mechanical and chemical expedients converted into manure, which under the most favorable circumstances costs considerably in excess of the sales; thus, at Rochdale, Mr. Thos. Hewsin, the engineer, reports as follows, for 1879: "The cost of the pail system with the disposal of the excreta in its crude state, is much more expensive than was the old privy system. The income from sales being no more, whilst the cost of collection will be from ten to twenty times as much."

The deep, large drains found near all the old Roman remains in England and on the continent, were built as conduits for drainage long before their use as sewers was thought of, and indeed it was penal in England before the year 1815 to cast human sewage into

them until a commission was appointed in England to inquire into the health of towns, the intolerable nuisance resulting from surface disposal of human excreta, was considered as the inevitable result of dense population growing out of the increase of great manufacturing interests crowded within limited areas.

Public attention was first called to the enormity of the nuisance then and there existing, by this Health of Towns Commission in 1844, less than forty years since, and in 1847 it was first made compulsory in London to use these drains for house sewage. It is difficult for us in this country, at this date, to realize the extent to which both the soil and the air were polluted, and the ravages of disease induced by the utter indifference to the exposure of human excreta in and around the residences, not only of the working and middle classes but of well-to-do residents as well. Decency will not permit more than a mere reference to the condition of things made public by the report of this commission; one or two extracts will suffice.

In Manchester the inspector reported in one locality in the city six hundred and forty-five houses, with a population of seven thousand and ninety-five persons, as having but thirty-three conveniences of any kind for the disposal of the house filth, and in another locality of the same city *three* or *four* entire streets were reported as without any accommodation whatever for that purpose, and in the report of the medical officers of the Privy Council, near twenty years later (1861), it was stated that in many cases in the centre of the towns no accommodation of any kind was provided.

We need not dwell upon the horrible condition of things which abounded in the crowded districts of England, nor wonder that as truer ideas of the dangers to health of this neglect began to prevail, residents in the districts should accept the pail system, operated, as was proposed, under strict official supervision, and at short intervals, (and notwithstanding what we should regard as, more or less, still a disgusting exhibition,) hail it as a most blessed improvement! It *is* unmistakably a vast improvement upon the reeking cesspools, open vaults and public manure-heaps, and the nameless abominations which previously abounded—a disgrace to civilization; but an intelligent native population have never tolerated these things, and if properly advised will reject the alternative which a lower grade of intelligence accepts with thanks. It cannot be denied, however, that we *have* a class of population very well disposed to revert to original habits, upon the principle probably of "persistency of type."

We naturally inquire why the existence of the larger underground drains should not have been availed of for the more ready disposal of this filth. To this it may be said that aside from the cost to the poorer classes, the use of the pail method, it was claimed, would keep out of the water-courses polluting elements which would otherwise render them unfit for domestic use, and at the same time give the agriculturists a more valuable manure, undiluted by water carriage, both of which purposes it very imperfectly performs. Setting aside the nuisance growing out of the careless misuse of this closet, the street filth washed by the rain, into the gutters, the baths, laundries and kitchen slops still require sewers for their disposal. Such sewers, where not previously existing, have been provided on a large scale even in towns where the use of the pail method was universal; and analysis shows that not only is the sewage therefrom equally polluting to the streams into which it is cast as is the discharge from water-closet towns, but that the bulk of the resulting sewage discharged from the sewers is in no essential lessened by the use of the pails. As to the sewage collected by the pail method the resulting manure has no such value as has been assigned to it, losing as it does so largely the chief fertilizing ingredient—the ammonia; for while the fæces, weight for weight, are more valuable than the urine, the value of the total amount of the latter is *six times* as much as the former, and the resulting ammonia is mainly lost in the preparation of the manure. A visiting engineer (Rawlinson) says of this manure at Rochdale, "I saw thousands of tons which the farmers would not take away." If this be true for the crowded areas and wasted lands of England, how much more in this country of unlimited virgin soil.

To show the emergency under which the pail method was advocated in England, the Irwill river basin (branch of the Mersey,) in which Manchester, Rochdale, Bolton, Bury, Oldham and other manufacturing towns are situated, has an area of three hundred and twelve square miles, and in 1871 a population of one and one-fourth millions, or near four thousand to the square mile, and increasing at the rate of two per cent. yearly, with eleven thousand and fifty factories of all kinds. The consequences have been that the streams are utterly unfit for domestic use, and notwithstanding the efforts to keep human sewage out of the streams, the waters are so polluted that the towns all seek their supply by means of storage reservoirs many miles off among the hills, and of very limited amount.

The Borough Engineers of England, in charge of sewage works,

formed an association some years since, whose proceedings are published from year to year, and from the papers contributed by engineers of prominence, members of the association, we can quote to almost any extent in entire condemnation of the pail method. Some of them, with a special experience of its working, can scarcely find terms sufficiently strong to express their disapprobation, amounting to *disgust*, of the pail method, even when operated under the best of circumstances; and the evidence is overwhelming that no community will tolerate the pail method if they could be *allowed* the water-closet, which in many places they are denied. In Manchester, with a public water supply, no houses below two hundred and fifty dollars rental are allowed the water-closet, and with varying rates of rental this is the principle established in the manufacturing cities in the north of England; a principle of classification is of questionable applicability in this country.

When, in 1880, Robert Rawlinson, Chief Inspector of the Local Government Board in England, was a royal commissioner to inquire into the sewerage and drainage of Dublin, great efforts having been made in that city to secure the adoption of the pail method by an official recognition of its advantages, after referring to Rochdale in Lancashire "as the locality where this method is best carried out, but at a yearly loss of £10,000 to the tax-payers," he concludes his report as follows:

"In our opinion, the cleanest and cheapest mode of removing excreta will be by water, through closets, drains and sewers to a common outlet. Houses must be drained, streets must be sewered so as to remove waste water, and if these drains and sewers are well and properly constructed *no additional expense need be incurred to transmit the entire volume of excreta from the houses and city*, if it is suspended in the waste water removed from the city through the drains and intercepting sewers to some outlet. The collection of the city excreta by means of movable pans or by the process of (so called) dry conservancy will cause more nuisance and be more costly than water carriage. The nuisance will be greater, because there will be retention of the excreta for a time on the premises, and the cost will be greater by the amount of labor necessary to collect the excreta, and also because there is no practicable mode of converting the excreta into a portable manure which will pay the incidental charges."

We trust enough has been said to show the fallacy of adopting the "pail method" of removing excreta in *cities* or populous districts in

this country, because local circumstances elsewhere may have rendered its adoption a preferable alternative. The characteristics of the locality should always govern the application of *any* system or method, however perfect in the abstract it might appear. The chief argument, that of economy or utilization, utterly fails as applied to our American cities.

EARTH CLOSETS, ETC.

The remaining methods of this system, such as the *ash closet* or the *dry earth closet*, require but a passing notice. The first, which consists in partially deodorizing the contents of the closet by ashes thrown into it whenever convenient, (but the contents not removed until the nuisance created compelled it,) was the intermediate stage between the dung-heap, open privy or midden, (so called,) and its successor, the pail or tub method. It was open to greater objection than the latter, as not admitting of official supervision to the same extent. The neglect of the lower classes to carry out any requirements essential to its inoffensiveness, if, indeed, any such there were, rendered the use of the ash closet offensive beyond expression. The resulting material was worthless for manufacturing into manure, and to cart it in its crude state direct to the land was attended by a cost, and other obvious objections, beyond its value.

The dry earth closet method might properly be as summarily despatched, but as illustrating the tendency of some individuals to seize on new methods of sanitation, and offer highly-wrought specious arguments in their support, unsustained by sufficiently extended experience, we cite the following as a warning to the ambitious sanitarian:

Some twelve or fourteen years since, a young American, now well known by his happy style of writing, adopted this dry earth closet from some English examples of its use, and endorsed it. I quote from his pamphlet, now before me, as follows: "I believe that these advantages, embracing the utilizating of a manure, *worth*, including kitchen and laundry waters, at least $10 per annum for each member of the family, old and young, and the removal of the most fertile source of typhoid fever and dysentery, and the prevention of cholera infection, together with the question of cost, will revolutionize the sewage question; and that public sewers will in future be restricted to the removal of liquid drainage alone." Testimonials, most emphatic and eulogistic in its favor, were obtained and published. The Earth Closet Co. was formed, local offices established, contracts for their

manufacture were entered into with the Colt Manufacturing Co., of Hartford, and agencies for their sale and introduction were established throughout the principal cities of the United States, as a preferable mode to that of the water carriage system for dealing with human excreta in cities, towns, &c.

Setting aside the enormous amount of fresh earth required, (a ton to an individual yearly,) even upon the assumption that it could be used over and over again without endangering health or comfort, and the consequent cost in cities, and the nuisance arising from improper use of the machine, not to say the danger to health thereby resulting, the manurial value of the earth after use proved no better than ordinary garden soil, and so far from a value of $10 per head, its use entailed a cost beyond any value which could be realized by its sale as manure, and it proved a total failure as an economical sanitary measure. It was suited only to isolated dwellings of a class where strict attention to its needs could be enforced, and we hear no more of it as a successful rival to water carriage. The details of this method need not detain us.

Second, a pneumatic system. The first method under this system is Lineur's, as applied in Amsterdam and some few localities in Holland, and is applicable to a dead-flat country, where sewage could not be moved by gravity. It is confined to the movement solely of the contents of water-closets, (without any flushing by water,) by means of their connection direct into iron pipes of small dimensions. A number of such pipes connect with a street main, which in its turn leads to a central reservoir, wherein, by means of the connection of the latter by a pipe with a grand central station, where a vacuum can be had by pump, the material, through the intervention of stops and valves, is sucked, as it were, to the station, where it must be removed by mechanical means, usually for manufacture into manure. Certain barometrical syphon traps between the house pipes and the street mains insure a uniform movement of the contents of closets whatever may be the amount of the material, whether much or little. The method has nothing to do with drainage of any kind, but is confined to the transport of human excreta alone, and is essentially limited in its range, and is attended, in first cost and maintenance, with an increased expense over simpler methods. The same is true of

Shone's method of the pneumatic system, which, in addition to the vacuum in the pipes, adds also a plenum process, by means of what are called "self-acting ejectors," operated by compressed air, supplied

by pumps at a central station, by which their contents are forced to the outfall. The advantages of Shone's method consists in lifting the sewage, at frequent intervals if needs be, to insure better grades in a flat country, or to overcome impediments, to a uniform grade, without thereby increasing the expense of motive power. This method is yet in the experimental stage in one or two towns in England, but has capabilities that it is thought may show to advantage in certain localities. The cost of the maintenance of this method under the severe frosts of our winters, will be a bar to its use on a large scale in northern localities; while elsewhere, the necessity of economy in first cost of works of sewerage will operate against its introduction. Its claim to a saving in the cost of excavation is of but little value, as this is but a small item in most localities. Neither method of the pneumatic system has as yet commended itself to our consideration by economical results attained, and in view of their increased cost we may safely await their more complete development under the fostering care of their designers.

We come now to the mixed system—that of water carriage—which divides itself into two methods, known as the "separate" and the "combined." Each has its merits, and each in the locality suited to its capabilities promises the best results attainable (so far as our present knowledge extends) by the modern system of sewerage. Then it only remains to determine which of these methods, combined or separate, best serves the need of the locality. As the question of sewering and draining a town refers generally to the selection of one of the two methods of this system or to their combination in the same locality, we shall examine them more in detail. The "separate" method, as its name implies, after receiving the house sewage in a pipe sewer (a line of small pipe for this purpose being laid on each side of the street) carries it by gravity to the outfall. The drainage of the yard and roof, as also the subsoil, are conveyed by a separate branch, either to the existing sewers under the centre of the street, or to a line of pipe laid purposely, but distinct from the pipes carrying the house sewage, the complete exclusion of rain water from the house sewage being considered as essential. The rainfall on the street is conveyed by open or covered gutters, connected at proper intervals with the main drain. Thus in a city, where drainage and the removal of the storm water are recognized as a desirable feature, no less than *five* lines of conduit are to be maintained in operation. This in connection with a flushing tank at the head of all the branch sewers, in order to a periodical cleansing of

the dead ends, which are without natural flow, constitutes the complete separate method. When in thinly-settled districts, or when from any cause it is not considered necessary to provide for the surface water on the street, this latter must find its way, after being collected in the gutters, to the drainage outfall of the district, or wait absorption by the soil or air, but the drainage of the roofs and paved yards, even in this case, must be provided for by a line of piping of some kind, and one for each side of the street, unless the streets are narrower than modern practice calls for, in which case a central line of pipe is made to answer the other needs. This method *separates* the sewerage entirely from the drainage of a town.

Some good examples of this method may be seen in some English towns, and it is frequently used in the suburbs of towns for limited areas. The most extended example of this method for an entire city, is shown in Memphis, Tenn., a city of some thirty-five thousand inhabitants, where, after the yellow fever epidemic of 1879, it was considered imperative to introduce some system of sewerage, and abolish the existing shallow privy vaults and cesspools, which rivaled, almost, in their extent and foulness, some foreign examples to which we have referred. These were considered to have contributed to the spread of the disease in that year, and it was but one of over a half dozen similar visitations in former years.

It is stated that the estimates for sewering the city by the combined method, that is to say, sewering and draining the entire territory tributary to the same outfall, was from $800,000 to over $2,000,000, but upon what basis we cannot say, as the smaller sum would have been a liberal estimate for the work required to be done. The estimate under the separate method for sewering alone, was but $225,000, neglecting any provision for surface draining. The funds of the citizens being inadequate to the larger outlay, they very properly, under the emergency upon them, adopted the separate method, which we are told has thus far proved entirely satisfactory. There has been no further outbreak of epidemic, but if the death rate is taken as an evidence of healthfulness, it has not realized the expectations of those who were interested in the work—a death rate as low as twenty per one thousand annually being estimated as the probable result of their labors, (see National Board of Health Bulletin Supplement No. 3, 1880,) whereas the death rate has scarcely been lower than double that amount, or near forty per one thousand (see Sanitarian for November, 1882), a high death rate for this country. The city of Brooklyn, for

the same time, shows but twenty-one per one thousand. With reference to the matter of cost, which will be examined further on, we would remark that notwithstanding the alleged economy in adopting the separate method of extremely small pipes, the expediency of doing so, in view of the complications which may arise in the future growth of towns, now say of ten or twelve thousand population, must be a question, and one which the local sanitarian must seriously consider before deciding in its favor. He must by no means permit his judgment to be influenced by the idea that this use of small pipes, confined to the conveyance of house sewage alone, is a modern invention. In reality it has been largely in use in suburbs in England and on the continent for the last thirty years, but is giving place to the combined method in populous districts, as the cheaper and more efficient. So far from its being "a new departure in engineering to maintain that a six-inch pipe with an inclination of $^1/_{150}$, was large enough to drain two hundred dwellings," as is stated in a late official document emanating from one of the engineers who was engaged in the Memphis sewer location, a very slight acquaintance with the literature of the subject will show that as long ago as 1852, at a time when the ordinary size of even house drains was two feet in width, and no sewer was built less than two or three feet in diameter, avowedly to enable workmen with spade and shovel to enter them as the only method of cleansing them, the general Board of Health reported to Parliament on this subject, wherein it was shown that a pipe of five-inch diameter, with an inclination of $^1/_{153}$, would suffice to drain the house sewage alone from twelve hundred houses.

The use of small pipes was then introduced, and though more efficient than the large brick drains previously in use, their advocacy was carried too far, as most innovations are, but it resulted in the almost universal introduction of small pipes in lieu of large brick sewers, and they now constitute the larger portion of every system of sewerage.

The *combined* method of the water carriage system consists, as we have seen, in simply providing one channel, and but one, for the discharge of the proportion of the storm water which is permitted to enter the basins placed at the street corners to receive it, together with the house sewage, and also the roof and yard water. As all water which enters the house leaves it as sewage, the measure of the latter is, in volume, the water supply. While this method is more costly to construct than is the separate, when the latter is

modified in its outlines to meet cases of emergency, or temporary expediency, as at Memphis, it is not more costly, when the two methods are compared in their entirety, and each developed to the extent of its capabilities, as claimed by their respective advocates.

The separate method has the advantage in this country of a godfather, whereas the "combined" method, being without protecting patents or fatherly interest of any kind from any one, can be cut and carved with impunity by any one calling himself an engineer. Any failures of absolute success in the method are very naturally attributed to the defect inherent in the system itself, whereas, imperfectly designed, it may be, in the first instance, it is very frequently built of inferior material and in disregard of true economy. Under the mismanagement peculiar to our changing city governments it is rather a wonder that the combined method has proved so rarely a failure. It is a *combined* method in more senses than one, as combining in many cases old and antiquated dimensions, as peculiar to the method, while they are not. As an instance, the Fleet street sewer, London, drained four thousand four hundred acres of city area; its outfall was twelve feet by eighteen, with a fall of one in four hundred and eighty. A modern combined sewer would fulfill its purpose in a circle of nine feet diameter.

We have seen that whatever may have been the personal uncleanliness of the common people in past times, and their disregard of ordinary decency in their disposal of domestic sewage, the danger of living on or near undrained land was fully recognized at all times, and the removal of surface water, not only in built-up cities, but even in the temporary camps of the period was dwelt upon by writers as old as the age of Augustus. The drains established for this pupose, some of them of extraordinary dimensions, became, in later days, the natural, even if unauthorized, receptacles for any refuse to be disposed of, including house sewage. What is, in many cases, now called the "combined method" of sewering, was not the result of original designs to that end, but within the days of some of us here, grew out of the application of old and existing works to a new purpose. Hence the failure of some of these hybrid structures when applied to more modern uses should not be taken as a standard by which to judge the system itself, when designed *ab initio* to serve the double purpose of surface drains and sewers, which is its function. Its growing use is an evidence that its double purpose is recognized as a sanitary need.

To properly examine the rival claims of the two methods would

consume much time and require extended illustrations in detail, and I am constrained to confine myself to a brief statement of the salient points of the two methods.

First. The separate method assumes that the removal of the house sewage alone is the first requisite, to which the drainage is secondary and comparatively unimportant.

To this it may be said that it is a common mistake to regard fæcal matter as containing the only foul elements in the composition of town sewage. That it is not even the preponderating source of such impurity is shown in the fact that, as we have previously stated, the chemical analysis of the discharge from the sewers of towns, where the water-closet discharge was *entirely excluded* from the sewers, differs in no essential, in its polluting elements, from the house sewage delivered by the small pipes of the town sewers entirely by the separate method, the collection of stable dung, amounting to one load daily for each quarter of a mile of Regent street, London. And sanitarians, in accordance with the belief which we have hinted at, as having obtained long centuries before any system of sewerage, as such, was thought of, agree in the danger to be feared from a damp soil, whether arising from undrained surface water or stagnant subsoil water, and regard the danger, though possibly less in degree, and less easily traced to its source, as no less *real*, and calling for equally efficient methods of removal.

Second. The sewers of the combined method, it is urged, are so largely in excess in point of area of section or capacity over those of the separate method, that the use of the former as conduits for the flow of the house sewage alone, or what may be called the dry-weather flow, is materially impaired, the depth of flow and consequent velocity being thereby sensibly diminished.

To this it may be said that with the flow reduced to the house sewage, in either case the same volume of liquid, will, in the smaller pipes of the separate system, (under the same inclination,) give a greater depth and velocity than it would have in the larger channels of the combined method, and so obstruction would be more likely to occur in the latter than in the former. But the difference in practice is much less marked than is commonly supposed, for in any modern example of the combined method a large percentage of the sewers are pipes, and in the branches, where the flow is limited in volume, pipes of small diameter, (differing but little, in their hydraulic radius, from the pipes of the separate method,) are invariably used. Thus in

Chicago, with three hundred and sixty-two miles of sewers, which are on the combined method, forty-four per cent., or one hundred and fifty-eight miles, are of vitrified pipes, and seventy per cent., or two hundred and fifty-two miles, are two feet or less in diameter; and in Brooklyn, of three hundred miles of sewers, eighty per cent., or two hundred and forty miles, are of pipes of eighteen inches or less in diameter. The obvious and inexpensive modes of clearing the sewers, either by temporary dams, city water supply, movable wagon tanks or other means of producing a temporary increase in velocity, above an obstruction, leave nothing to be desired on the score of efficiency or economy. The last year's report in Chicago shows the expense of preserving their entire system free of obstructions, to have been but one and eight-tenths cents per lineal foot. If the authorities are so disposed, the pipes of the combined method could be flushed *daily* by the flushing tank method, which is said to work so well in Memphis, and the combined flush from all the branches would give ample volume of water to sweep the main brick sewers.

Then there is the method of cleansing sewers by means of what is called a "pill," being a ball say two inches less in diameter than that of the sewer, which is put in at a manhole, and being driven along by the force of the water until an obstruction is met, when the ball becomes a dam, and the water escaping under and around the ball rapidly loosens up the material and sweeps it along the sewers followed by the ball. This method, according to Mr. Fowler, the engineer of New Haven, is completely satisfactory in that city, and the cost of preserving the entire system of sewers free of deposit is a little over one cent (1.08) per lineal foot yearly. Again, there is no difficulty whatever in furnishing a channel in the larger sewers which will concentrate the low flow into a section of precisely the same area and boundary as obtain in the pipes of the separate method. This is known as the *cuvette* or *cunette*, (either word is used,) and resembles the lower half of a pipe built into the brickwork, which, while furnishing no impediment to the storm water flow, concentrates the ordinary dry flow into a narrow channel. While its uses have been satisfactory the necessity for it has not been considered sufficient to justify even the slightly additional labor expended in its construction.

Third. The small sewers of the separate method are claimed to be more easily cleaned than the larger dimensions of the combined, by the process of flushing, which consists in the sudden application of a large volume of water with a velocity which sweeps away any obstacles.

It is scarcely credible to state the nature of the substances which no possible supervision is found adequate to keep out of the sewers. The fact must be recognized that nothing which can, by any device, get into them, and many things which it would be supposed were impossible, do find a lodgment at times in city sewers and form the nucleus of obstruction. As obstructions are found mostly on the branch sewers, from the limited amount of liquid there furnished, what are called flushing tanks are built at Memphis, holding each about a hundred gallons, 'at the end of all the branch sewers, which automatically empty themselves daily, and sometimes oftener, and passing into the small six-inch pipes fill the lower half and assist very materially the flow of the house sewage; and if need be, the city water supply may be readily turned into these tanks, thus tending to remove anything movable by water. If, instead of these small pipes, larger ones for rain had been built on the same grade, and with their bottom shaped like those of the small pipe, (cunette,) the same quantity of water, applied in the same manner, would produce a precisely similar effect. As the upper branches of the combined method are, as we have stated elsewhere, now universally of twelve-inch pipe, neither of the methods possesses any advantages one over the other in the ability to remove obstructions by flushing. Nor must the value of the rainfall be lost sight of in the combined method as a powerful means at times for sweeping away and thoroughly cleansing the entire system of pipes and sewers in a manner unapproachable by anything which the separate method has to offer.

Where the obstruction resists the flushing process, the combined method by its dimensions, offers great facilities of access, whereas, in the separate, (if built without manholes, as at Memphis,) the street must be ripped up and the sewer broken into.

Fourth. It is alleged that the large sewers generate and contain a greater quantity of noxious gas than do smaller ones, and are not so easily ventilated.

We know but little of the method of generation of the gases or vapors of sewers. It might be supposed that the greater area of the larger sewers would favor the generation of more gas, but it might be remembered also that the cubical contents of sewers increase faster than do their areas. The surface in a four-foot sewer is to be four times as great as is that of twelve inches diameter, but its area is sixteen times as great; from this we might infer that with any circulation of air in the sewer, the larger one would be nearer the condition of the

external air, and experience seems to confirm this fact. With respect, however, to the effect of this in dwellings, the quantity of gas in a sewer is of no consequence; it is the degree of concentration which is important. And in this respect large sewers have, it would appear, the advantage over smaller ones. Experience has not verified the claim that the smaller sewers are easier ventilated than the larger. With the main house drain untrapped, (and open to the roof,) as is entirely admissible in good workmanship, it would be easy to ventilate efficiently sewers of any size through the house pipes, since the combined area of the latter is many times greater than that of the sewer. But if it be considered more important that the house pipes be properly ventilated, as is the prevailing opinion, then with a water trap on the main drain it would be independent of the method which might prevail in the dimensions of the sewers themselves, whether small or great.

Fifth. The relative expense of the two methods is claimed as largely in favor of the separate method, as applicable to localities which would otherwise be debarred from the benefits of the water carriage system.

This to a certain extent is the fact, but it must be taken with some qualifications.

The first cost of a method of sewering, if confined to the bare purpose of removing the house sewage, will, if modified to suit exceptionable conditions, as we have previously stated, cost less than a method which at the same time aims to drain a portion of the storm waters from the streets, with the droppings of animals and other street refuse, together with all the water of back yards and roofs. That is to say, if a single pipe of six inches be laid in the centre of the street for the sewage of both sides (as at Memphis), otherwise, not.

The first twenty miles of the sewers laid in Memphis, it is said, cost $1.30 per foot, but at least thirty cents per foot were saved by omitting any manholes in the street, a saving as it has since appeared of questionable expediency, as we learn that it has since been found necessary to introduce them. Hence, an estimate of at least $1.50 per foot would be within the actual cost. There being very few cellars in Memphis, or structures below the level of the street, which ordinarily would be required, the drainage from the yards and roofs, which this method imperatively forbids, into the sewage pipes, must be otherwise provided for, and could not be had at less than $1 per foot. This makes the separate method without any street drainage whatever, to cost at least $2.50 per foot, or one-sixth less than the cost of the

combined method in Chicago, which was $3 per foot, including fixtures and every attendant expense, the sizes of sewers ranging from one foot in diameter to nine feet. The extension in Chicago the last year shows the cost of twelve-inch pipe as $1.14 per foot, the fifteen-inch, $1.33 per foot, the eighteen-inch, $1.88 and the two-foot, $2.08 per foot. These three sizes would probably be ordinarily used in a separate method but with a larger proportion of small pipe.

The cause for no greater saving being shown in the separate method grows out of the fact that there are many items of cost in sewer construction which do not decrease with the size of the pipe used, such as superintendent, office expenses, sheeting, trench excavation, pumping from foundations, repairs to roadway, &c., and as the cost of excavation increases owing to quicksand or other material difficult to manage, this disproportion in price may become insignificant. Thus sewering alone might prove as expensive in first cost by the separate method as would sewering and draining by the combined, and in addition, the maintenance of the separate method would be more costly than the combined in a northern climate.

Sixth. Rain water in excess is claimed by the advocates of the separate method to be seldom more than inconvenient, and at most places can properly be allowed to flow off over the surface of the ground as it did before the introduction of sewers.

While we considert his argument to have been met by hinting at the well-known injurious effects of stagnant water upon human health and life, we can add that precisely the same sort of reasoning would apply to the sewage itself before the introduction of sewerage works.

Seventh. Where it is absolutely necessary to remove rain water, as well as sewage, by underground conduits, it still may be effected more efficiently, it is claimed, by having separate channels of discharge, and a superior efficiency had by a slightly increased cost.

To effect precisely the same purpose as the combined method, the separate will cost nearly one-half more, and their superior efficiency is not apparent, while there are many objections in the maintenance of so many lines in working order. The liability of misuse of the several pipes by wrong connections designedly effected to save cost, has often taken place in England and would be still more likely to occur here. As to maintaining that nothing can get into these small pipes which they are unable to discharge, the fact remains that they do become choked through ignorance or carelessness, to an extent sufficient to give constant employment to special workmen.

Eighth. Increased facility is claimed for the separate method where pumping, or a treatment of the crude sewage for manufacture of manure becomes necessary.

Where cellars are of necessity below the level of the street sewers, and pumping must be resorted to in order to drain them; the less the volume to be pumped the cheaper will be the process, without doubt. But as to the further utilization of the sewage, it is to be presumed that the capacity for rain water, which the large conduits of the combined method possess, need not be availed of throughout their entire extent, as by a system of penstocks and storm overflows heavy storms may be diverted to the water-courses, and little more than the ordinary flow of the town sewers at such times need be led to the manufacturing works to be dealt with for manure.

I have thus briefly sketched the salient points of the two methods of the water carriage system, with the claims made by the advocates of the separate method for universal applicability, and the counter arguments in support of the combined method. It could be wished that a more complete analysis of the respective methods had been presented. But the subject more in detail has been well treated by Mr. Elliot C. Clarke, engineer of the Boston sewer department, in the second annual report of the Massachusetts State Board of Health, Lunacy and Charity, Supplement, 1880, to which I would respectfully refer you as a most exhaustive article on the water carriage system, which shows very satisfactorily, as I think, the benefits to be derived from the combined method for populous districts, with the exception, however, that he allows a greater dimension and consequent cost for storm water sewers, than modern practice would probably call for. Justice requires me to add, that to this paper of Mr. Clarke's a reply has been made by Col. Geo. E. Waring, who projected the Memphis sewer system, and published in the March and April Nos. of the American Architect for 1882. For the rest, permit me to call your attention to the report of Mr. Rudolph Hering (who occupies the first rank as a sanitary engineer in this country), made to, and published by the National Board of Health, December, 1881, Bulletin, Supplement No. 16, wherein after a clear and concise review of the works of sewerage in European cities, he so illustrates the working of each as to enable us to sum up the conditions under which each of the methods which we have considered of the water carriage system, is properly applicable; and they may be condensed as follows:

The *combined* is suitable—

First. When rain water must be carried off underground from extensive districts, especially when they are closely built up as in large cities, and where new sewers must be built for this purpose.

Second. Where purification is not required, or is not difficult, and storm water overflows are not objectionable in polluting the streams.

Third. When a sufficient amount of water or sewage is available for flushing the larger sewers.

The *separate* method is suitable—

First. Where rain water does not require extensive underground removal, and can be concentrated in a few channels slightly below the surface, or where it can safely be made to flow off entirely on the surface. Such conditions are found in rural districts where the population is scattered, or small, or at least in short drainage areas, and on steep slopes or side hills.

Second. Where an existing system of old sewers which cannot be made available for the proper conveyance of sewage can yet be used for storm water removal.

Third. Where purification is expensive, and where the river or creek is so small that even diluted sewage from storm water overflows would become objectionable, especially when the water is to be used for domestic purposes at no great distance below the town.

Fourth. Where pumping the sewage is found too expensive to admit of the increased quantity from intercepting sewers during rains, which can occur in very low and flat districts.

Fifth. Where it is necessary to build a system of sewers for house drainage with the least possible cost and delay, and the underground rain water removal, if at all necessary, can be postponed.

In selecting a system or method, in addition to the first cost, there must arise the usually embarrassing question, Where shall the outfall of the public sewers be located? In answering this question neighboring towns as well as individuals must be consulted, or an item for damages might otherwise arise. This question of the disposal of sewage, in which health and comfort are balanced against cost, is before many of our towns to-day. When we recollect that there are some six hundred towns in our country provided with public water supply, and at least *four*-fifths of them as yet without any system of sewerage or drainage, it will be seen that the final disposal of town sewage, in a manner, so as to avoid the pollution of the water-courses or sources from whence the domestic water supply is derived, is becoming a matter for grave consideration on the part of sani-

tarians. The vexed "sewage question" we have read and heard much of, while its solution was of but general interest, but the rapid improvements in our own country are bringing it home to our doors as a question of individual as of national importance. We thus need to consider

The treatment of sewage called utilization.

Before examining this, we would remark that the average amount of human excreta may be stated as 120 gallons, or 16 cubic feet yearly —.044 cubic feet daily, and estimated to weigh 2.8 pounds. If the water supply be 20 gallons per head—2.66 cubic feet daily—this is sixty times the bulk of the human sewage, or combined, may be stated as 2.7 cubic feet. The excreta alone from an individual has been variously estimated, as in a manurial point of view, worth from $1.25 to $2.60 yearly of the population. As the water which enters a house leaves it as sewage, our greater water supply, (as well as rainfall,) renders our domestic sewage in bulk about one-half as valuable as that of English towns, six-sevenths of which is in solution, or about one cent per ton, (Seventh Annual Report Mass. State Board of Health, 1876.) It is estimated that it takes two thousand four hundred tons to equal analytically one ton of guano.

Where sewage can be cast into the sea or tidal river without the danger of returning upon the shores, or attended with any other unsanitary condition, experience fully indicates that this is the best possible disposal of it; though simple as it appears, it is sometimes attended with difficulties, which add very greatly to the expense. But no presumed theoretical value in the elements which go to form sewage should induce a town or city thus circumstanced to attempt as a commercial undertaking its utilization, either by putting it crude upon farm lands in the neighborhood, or manufacturing it into dry manure for transportation. But where the district is situated upon inland waters, and the summer or low flow of the stream is less daily than twenty times the daily volume of the sewage, the latter estimated as not less than the artificial water supply during the same interval, or where periodical impediments exist to the uninterrupted flow of the stream into which the sewage is cast, such as dams, ponds, &c., and the sewage is retained for a time on its shores to breed pestilence; or when the district is wholly inland without living streams of any magnitude in its vicinity, the ultimate disposal of the sewage without endangering the health of the people, becomes a matter of grave consideration. Some process must be resorted to by which it

may be rendered harmless, called utilization, not in hopes of a profit to the town, but to be effected at the least possible additional expense to the tax-payers. This is the best result to be hoped for, (in our present knowledge of the subject,) and to this end several methods are in use.

These methods are precipitation, irrigation and filtration.

Precipitation. This consists in receiving the crude sewage at the outfall into tanks, and by adding some chemical ingredients, the solids held in suspension are precipitated, and the effluent liquid, more or less clarified and deodorized, is allowed to escape into the streams. What is called the "sludge," of the consistency of thick mud, remaining at the bottom of the tanks, is raised by various methods, and either by the application of heat or machinery is dried and disposed of as manure, but is ordinarily not so valuable as to command any ready sale. This sludge sometimes accumulates in such quantities as to necessitate the purchase of land with a view to its *burial.* In Birmingham, with a discharge from the town of twelve million gallons of sewage daily, and the use of thirteen tons of lime, the daily amount of sludge on their hands is not less than four hundred tons. Neither is the effluent water in all cases more than clarified, without being purified, and soon becomes more or less offensive. Under favorable conditions as to subsequent dilution in running streams, the process has in individual cases been moderately successful in a sanitary point of view, and at no great cost. The hope thus held out of final success, has resulted in innumerable patents being taken out for treatment of sewage by precipitation, among which the following may be named:

The A. B. C. process, so called from the initials of the ingredients used in the precipitation, alum, blood and clay; the phosphate sewage process consists in the use of alumina and lime; Bird's process uses what is called sulphated clay; Stethart's process, lime, sulphate of alumina, sulphate of zinc and charcoal; Hille's process, lime, tar and salts of magnesium; Marsdens & Collin's process, lime, carbon from the manufacture of prussiate of potash, ashes, soda and perchloride of iron; Holden's process, lime, sulphate of iron and coal dust used under certain modifications, in deodorizing the sewage of one of our extensive summer hotels on the coast of Long Island; Fulda's process, of lime and suphate of soda; Blythe's process, superphosphate of lime with magnesia and lime; Whitehead's process, dicalcic and monocalcic phosphate and milk of lime; Campbell's

process, phosphate of lime and lime added; Hansen's process, lime, black ash and red hematite, treated with sulphuric acid; Goodall's process, lime, animal charcoal, ashes and sesqui-persulphate of iron. The lime process alone has been in use forty years or more. It offers economy in first cost, but it cannot be considered as successful, the resulting sludge accumulating in such quantities for lack of a demand by the farmers that its disposal adds much to the expense. Scott's process, by which this sludge is manufactured into cement, is well spoken of; other processes, such as Higgs', Dale's, Demsdale, Leuk, all *promise* success enough on a small scale, to encourage the patentees, but invariably, when extended, have resulted alike in failure. All these precipitation processes do, to a certain extent, purify the sewage or clarify it, chiefly by removing the suspended matter from the sewage; but they all leave a very large amount of putrescible matter in the effluent water. At least all the ammonia contained in the sewage is carried off in the effluent fluid, and sometimes the quantity is increased. The resulting manure that they produce from the sludge is in every case very inferior, as the valuable constituent of sewage consists mainly in the ammonia, which is lost to the solid manure, showing the futility of the attempts to utilize sewage by precipitation alone.

Irrigation. This, it is stated, has produced good results. In Edinburgh, some two hundred years since, the simple process of irrigating the meadows of Craigentinny by crude sewage was undertaken. It still continues there after a long interval during which it was disused, without much change in the process, and with no more favorable results to the city treasury.

The average results from a large number of towns show that owing to the necessity of leaving the land to recover itself after being drenched with sewage, (but the flow of sewage meanwhile being unintermittent,) some three hundred and sixty acres are needed for every million of gallons daily of sewage. The cost of the operation is largely increased by the high value of land in England, and hence, scarcely a guide for us on the score of expense. The process now consists in preparing the land by disposing the surface at short intervals into ridges and furrows, with such precautions as regards levels that the sewage being led by the main conduit and branches (sometimes open trenches,) over the surface, will nourish the roots of the plants, then drain off to the outfall discharging into some stream. Even dry sand beaches have returned good crops by this treatment; and though bad smells

are reported as rife, thus far it does not appear to be attended with any danger to health. Below Paris, at Gennevilliers, where the irrigation by means of some ten or twelve million gallons of Paris sewage daily over some twelve hundred acres is now carried on, a village, acccording to Mr. Hering's report, has sprung up in the midst of the irrigation field, the death rate showing as low as 19.5 per one thousand of the population. Additional land is being taken in yearly and the works extending, not without remonstrance, however, from residents in the neighborhood, who declare it a nuisance every way.

Filtration alone has in all cases been abandoned, but more recently what is known as *intermittent downward filtration* is claiming attention, which consists in preparing the ground, which in the first place must be of suitable character and favorably situated, by deep underdraining, say not *less* than six feet, and passing the sewage both over and *through* the land intermittently, that is, allowing certain areas time to aërate and recover themselves before a renewal of the operation. The claim is that by this process a much less extent of ground, say twenty to twenty-five acres per million gallons of sewage daily, will suffice for purifying the sewage. The precise benefit over the method of broad irrigation is not yet determined, and except under favorable circumstances its advantage over the other has been seriously questioned. It has been proposed to use this method in connection with broad irrigation.

The value of these several processes is reported upon by "the Executive Committee of the Society of Arts [England,] conference," as follows:

"With regard to the various processes based upon subsidences, precipitation or filtration, it is evident that by some of them a sufficiently purified effluent can be produced for discharges without injurious result, into water-courses and rivers of sufficient magnitude for its considerable dilution; and that for many towns, where land is not readily obtainable at a moderate price, these particular processes afford the most suitable means of disposing of water-carried sewage. It appears further that the sludge, in a manurial point of view, is of low and uncertain commercial value; that the cost of its conversion into a soluble manure will preclude the attainment of any adequate return on the outlay and working expenses connected therewith, and that means must therefore be used for getting rid of it without reference to possible profit," and fnrther: "In certain localities where land at a reasona-

ble price can be procured, with favorable gradients, with soil of a suitable quality and in sufficient quantity, a sewage farm, if properly conducted, is apparently the best method of disposing of water carriage sewage. It is essential, however, to bear in mind that *a profit should not be looked for by the locality establishing the sewage farm, and only a very moderate one to the farmer.*"

In addition to the above method of sewage disposal, we may add a word as to the effect of casting it into the sea; regarding this as an obvious method on the long eastern coast of this state, but one which may ultimately prove embarrassing to some of the fashionable resorts there growing up, unless the proprietors are willing to put their hands into their pockets and pay for the cleanliness that is akin to godliness. This coast, open to the full sweep of winds from the ocean, and the absence, save in a restricted sense, of any literal off-shore current, will render the final disposal of crude sewage a matter of some difficulty, as being sure of being thrown back upon the shore. With the open sea before them, and apparently exempt from the consideration of sewage as requiring purification before throwing it away, the evidence of this necessity will be likely to be received with great unwillingness at first. Yet it may be considered *certain* that this evidence of the necessity of such a measure will accumulate to such an extent that some means for the classification of the sewage, at least to the degree of rendering its subsequent dilution by sea water a sufficiently sanitary measure, will undoubtedly prevail earlier or later. Some form of precipitation will be resorted to, the effluent water temporarily deodorized, but undoubtedly putrescible, being discharged periodically at a distance from the shore and at certain states of the tide, and the sludge removed by boats, or otherwise disposed of as it best may be.

The same or similar methods may be resorted to on rivers whose waters serve at the same time for domestic use further down stream: but the process of purification must be carried further than that indicated above, to the extent of purifying and deodorizing the effluent water before discharging it into the river; this may be effected by some of the processes of irrigation or intermittent downward filtration, which have been shown to be efficient to that end in a sanitary point of view, *but at a cost.* This cost is dependent upon the circumstances of the case, and we have as yet in this country too little experience of our own to determine beforehand. We may confidently expect, however, that the volume of our rivers, our less crowded

areas, the consequent reduced value of land for sewage farms, the comparative freedom from fogs, and long-continued dampness of atmosphere, retarding evaporation, and the greater prevalence of bright sunshine, all the favorable attendant circumstances, indeed, except the one of greater severity in our winter climate, are calculated to reduce the expense attendant upon the final disposal of sewage from our inland towns, in comparison with the experience in England; the average cost there, by irrigation, being stated at about $39 for every million of gallons of sewage treated daily, that is, over and above any receipts for sale of manure or the sale of resulting crops.

Brooklyn, December, 1882.

THE DISPOSAL OF TOWN SEWAGE.

BY PROF. CHARLES McMILLAN, C. E., PRINCETON.

Projects for the disposal of sewage belong to one of two general classes, viz.:

First. Schemes for wasting the sewage, and

Second. Schemes for purifying it and utilizing its fertilizing ingredients, in whole or in part.

It is to the former class that your attention is particularly invited. Schemes for wasting sewage, especially when executed on a large scale and under suitable conditions, are, unquestionably, the least expensive. They are usually adopted because of the nearness of a very large body of moving water, which may serve at once as a diluent of the foul matters discharged into it, and as a natural vehicle for their speedy removal beyond the limits of the town or other settlement where they originate. The easy access to such a body of water is, of course, an essential condition for the successful prosecution of such a scheme.

Towns thus situated are particularly fortunate in having at hand so inexpensive a mode of getting rid of their wastes; and even small settlements, if not too straggling, may find it profitable to consider whether systematic sewerage, under such circumstances, would not be more satisfactory, in every way, than the usual expedients adopted in such places. But, on the other hand, it should be remembered that while the pecuniary advantages of wasting sewage into streams are often very great, a corresponding degree of caution must be observed in resorting to this mode of sewage disposal, and proper attention should be given to the sanitary questions which are involved, whose satisfactory solution should, in every case, precede the adoption of such a scheme. These questions relate to the degree of pollution which the sewage will produce in the stream, especially during periods of low

water, and to the consequent possible invasion of the rights of communities or individuals dwelling below the points of sewage discharge.

It must be acknowledged, however, that this general inquiry does not usually admit of a satisfactory answer. The degree to which it is safe to pollute fresh-water streams is as yet little understood. Neither our own practice nor the experience of European engineers, nor yet the important work already accomplished by the Rivers Pollution Commissions of Great Britain throws sufficient light on the subject to raise it above a tentative level. This should not be a cause of surprise when the intricacy of the problem is considered, the variableness of its elements, and the meagreness of our information regarding those very facts which would naturally constitute the known or given quantities of such investigations. Some eminent authorities, after inquiries conducted under circumstances especially favorable as regards the means and talent at command, have declared it to be their opinion that water that has been once contaminated by sewage or manure matter is henceforth unsuitable for domestic use. Many practitioners, however, while acknowledging the great danger lying in the presence of even very minute quantities of *crude sewage* in potable water, lay more stress than the authorities whose opinion has been quoted on the self-purification of streams, especially through the destructive agency of free oxygen and of aquatic plants, and are therefore disposed to regard the above sweeping condemnation of sewage-tainted waters as too broad an inference from a limited range of observations.

It is true that a scheme for discharging sewage into a river whose volume, even at low stages, is vastly in excess of that of the impure liquid that it receives, is not burdened with much perplexity.

But such cases, as we all know, are the exceptions. Their freedom from complications of a sanitary nature, so far as sewage disposal is concerned, usually renders them, in that one feature, neither objects of concern to sanitarians nor, I may add, the most fruitful sources of the incentives to an active investigation of the important questions relating to the conservancy of streams. It is generally the smaller streams of the more densely populated portions of a country which, when made the receptacles of filth, compel attention to the necessity of greater cleanliness in this respect, through their assaults on the senses and on human interests to the extent even of affecting life itself.

It is unnecessary to enter into an enumeration of the reasons for the protection of fresh-water streams from pollution. They are so generally recognized as to need no repetition here. The time which

might thus be occupied will, therefore, be devoted to the more important purpose of endeavoring to reach a proper understanding as to the manner in which the expediency of temporarily using any stream as a receptacle for sewage may be approximately determined. I say *temporarily*, because an increase of population must sooner or later disturb the basis on which every such project is founded and necessitate, in some measure, the diversion of the sewage to filter beds or other means of purification as a preliminary to admitting the sewage effluents to natural watercourses.

The British enactments for preventing the pollution of rivers prohibit the discharge into streams of all sewage that has not previously been raised to a given degree of purity. The standard required by them is an arbitrary one, and is applied to all fresh-water streams alike, without regard to their natural purity, size or any other varying conditions. Moreover, a strict compliance with the requirements "appears to be construed into its being necessary to deal with the sewage on land, so that those towns which are so situated as to be unable to dispose of their sewage on land have no means of attaining certificates that they were dealing with their sewage efficiently."* These reasons and others, prominent among which is the friction caused by a failure to apply the law uniformly and simultaneously to all the settlements of a given drainage district instead of to isolated towns, seem to have caused the decree of the Rivers Pollution Commission, especially in their earlier applications, to fall short of securing even a moderate share of the advantages which were expected from their promulgation.

Some of the difficulties are set forth by Dr. Wallace in a lecture before the town authorities of Glasgow. He says: "In the case of a number of towns, such as Birmingham, Bradford and Leeds, the purified sewage is incomparably purer than the grossly-polluted streams into which it flows. These and many other towns are subjected to the manifest injustice of being compelled, under heavy penalties, to render their sewage clear, inodorous and almost perfectly colorless before discharging it into rivers or streams, which are often, as in the case of the Bradford Beek, literally common sewers of the foulest description. The inhabitants of these towns complain, and with good reason, that in the upper reaches of the rivers wholesale pollution is permitted, while they have been put to great expense in order to accom-

* "Sewage Disposal," by Henry Robinson, C. E., London, 1880.

plish a purification, the effects of which are swallowed up in the filth of other towns over which they have no control." This was uttered only three years ago.

Now, while I have no kind of doubt that the strict rule adopted by the English will ultimately be found, from a sanitary point of view, to have been a great blessing to the entire kingdom; and while it may be, although I am inclined to doubt it, that uniformity of standard is calculated to furnish sanitary authorities with the most practical basis of control of these matters in a country whose population is as dense as that of England, and many of whose rivers have been so long and so greatly befouled, I cannot help viewing the total exclusion of crude sewage from the streams of Great Britain by the proposed enforcement, under every variety of circumstances, of a fixed and high standard of purity for sewage effluents, as a somewhat hasty and oppressive expedient for accomplishing a beneficent end. The opinions of those who have recommended this measure are very properly esteemed of great weight, and yet it may be fairly questioned whether a plan quite as efficient and less burdensome to the public than that adopted might not have been reached by endeavoring to provide for a more gradual restoration of the purity of the streams, by beginning the cleansing process near the sources of the streams instead of at points nearer tide water, and by solving each case of pollution by the sewage of a settlement in the light of its particular surroundings, and its bearings on the welfare of lower neighborhoods, instead of regulating all cases by a fixed rule and standard. The framers of the Rivers Pollution Prevention Act of 1876, seem to have realized the hardships with which the total exclusion of crude sewage from streams would bear on communities already provided with extensive sewer systems delivering into streams, and have drawn a very marked distinction between old works and new ones, and in favor of the former, by a clause which, singularly enough, as Mr. Robinson says, has caused the act to be practically inoperative.

But even should the present mode of dealing with this question in England be admitted to be the best for that country, it does not necessarily follow that it is equally as suitable for others. The limited area of England, the denseness of her population and the long neglect of her rivers, which has made some of them literally open sewers, are, unquestionably, the important causes that have made the conservancy of British streams a vital question. And it may be that the accumulated evils arising from these causes call for immediate and

heroic remedies. But in a larger country less densely inhabited than England, and possessing a different climate, the conservancy of its streams may readily become, under such different conditions, a problem of much less gravity, wherein considerations of economy might be allowed a reasonable weight without endangering human life, and whose solution, therefore, would admit of a more liberal and comprehensive treatment with regard to *all* the interests involved.

In our own country all the conditions are so very different from those existing in England that the purity of our streams has not yet become, except in a few localities, a matter of great concern. It is, nevertheless, a very important and a growing question, which year by year, as one stream after another becomes tainted, will force itself more pressingly on our attention. There is no escape from it. And it were therefore wise in our authorities to institute, through the agency of properly constituted commissions, early and systematic inquiries into the whole subject, with the view of being prepared to regulate the admission of impurities into streams. It is believed that the conclusions from such inquiries in this country will differ very materially from those reached by the British commissioners, especially in regard to the necessity in the immediate future of excluding crude sewage from streams.

But now the question may be asked, How is a reasonable degree of purity to be maintained in our streams if the exclusion of crude sewage from them is not to be regarded, as it is in England, as the very key to the solution of the problem? The answer is: By regulating the discharge of crude sewage, in every case, to suit the capacity of the receiving stream in such wise as not to raise the impurity of the latter, at a stated distance below the outfalls of the sewers, beyond a limit to be determined by the nearness of settlements, by the natural condition of the stream and its powers of self-purification. It is believed that a careful observance of this rule will in almost every case lead to a practical and not unfair solution of the question. Thus, it may be found that in one case it is unsafe to cast any crude sewage into the stream, and therefore that resort must be had to cleansing processes; in another, that a partial delivery of crude sewage is admissible; or, as in the case of our large rivers, that it is perfectly expedient for a considerable period of time to resort to the stream for sewage disposal. However, the investigation of any particular case should be a guarded one, for reasons given further on; and it should also be remembered that the tendency to practice economy at the

expense of our neighbors operates, unfortunately, with especial force in problems of this kind, and that the menace to other neighborhoods arising from a selfish economy or from errors of judgment, may be a very grave one.

On the other hand, I believe that while such investigations need not and cannot be pressed to the point of absolute certainty, they will have been conscientiously carried out when the possibility of injuriously defiling the waters used by neighboring settlements shall have been reduced to a very remote contingency.

The rule which I have advanced is based on the assumed power of self-purification of running water. We have, unfortunately, but little specific information on this point, but that which has been gathered indicates, unmistakably, that all streams have, in a greater or lesser degree, the power of converting organic impurities into harmless compounds. The Rivers Pollution Commission gives a *résumé* of their observations on the point in question in their report of 1874, the practical deduction from which is that, while the destruction of organic matter does go on in sewage-laden streams, the process is nevertheless a very slow one. Their observations of this phenomenon in natural streams are not recorded in a form which would be available for use in this paper; but the general conclusion from a laboratory experiment of the commission* is that, at a mean temperature of 68° Fahr., a given volume of sewage diluted with twenty times its bulk of fresh water would lose at the utmost about two-thirds of its organic impurities in a run of one hundred and sixty-eight miles at the rate of one mile per hour, or in about a week. These experiments have been deemed important because they were purposely restricted to a given mixture of sewage and clean water, in order to remove all uncertainty from the "variability of the composition of the river waters at different times of the day," and also because of their results which have been so widely quoted. The agitation of the mixture while conducting the test was more favorable to its thorough aeration than that which would usually arise from the natural movement of streams;

* "Water and Water Supply," by Professor W. H. Carfield—Van Nostrand's Science Series, 1875.

A mixture of London sewage and clean water having, after mixing, .267 parts of organic carbon and .081 of organic nitrogen in one hundred thousand parts of the mixture, was thoroughly exposed to the atmosphere and agitated by being syphoned from one vessel to another, falling each time through three feet of air. At the end of ninety-six hours the mixture was found to contain .250 parts of organic carbon and .058 of organic nitrogen; and after one hundred and ninety-two hours, .2 of organic carbon and .054 of organic nitrogen.

and this advantage may possibly have compensated for the lack of any cleansing agency akin to that of aquatic plants, which are believed to play no inconsiderable part in the destruction of the organic constituents of water. Whether there was any such compensation is very uncertain and, therefore, in deducing a general inference from the experiments, our conclusions may be somewhat in error from being based solely on the effects of the reducing agencies employed, viz., the free oxygen held in solution by the water and the atmosphere.

The thoroughness and rate of oxidation of a given quantity of organic matter in liquid form will very probably be in a direct proportion to the volume of fresh water used for its dilution; that is to say, if the amount of fresh water be doubled, the rate of cleansing a given bulk of sewage will probably be twice as great as it was before, and so on.

It is natural to suppose that the oxidation of the sewage will progress more rapidly as the time of its exposure to the effects of the clean water increases, for, the amount of organic matter will be constantly diminishing while the volume of the stream remains constant, and its store of free oxygen is all the time being replenished from the atmosphere. A theoretical consideration of the actual conditions seems to indicate that the average rate of oxidation, in different times, varies according to a law which is rather too unwieldy for use in a computation which is only after all a rough approximation. I have, therefore, assumed the rate to vary in the simpler ratio of the squares of the times. This will lead to some error, but inasmuch as our computation will have to progress from small degrees of dilution to higher ones, the errors will be on the safe side, as they should be.

The results are shown in the first two columns of the following table. The third column will be explained further on. (See page 108.)

TABLE NO. 1.

Degree of dilution of sewage.	Times required for cleansing.	
1 part of sewage to 30 parts of water.	168 hours.	[168]
1 " " 40 " "	145 "	[139]
1 " " 50 " "	130 "	[119]
1 " " 100 " "	92 "	[75]
1 " " 200 " "	65 "	[48]
1 " " 300 " "	53 "	[36]
1 " " 400 " "	46 "	[30]
1 " " 500 " "	41 "	[26]
1 " " 1000 " "	29 "	[16]

If this table is at all a fair inference from the data referred to, it would indicate that a stream flowing at the rate of one mile per hour, which received $^1/_{1000}$ part of its own volume of sewage, would have to run twenty-nine miles before it would regain its normal purity.

An example bearing on the same point is derived from the condition of the Seine below Paris. The total discharge of the sewers of that city is about one hundred cubic feet per second. About one-sixth of this is diverted to the sewage farm at Gennevilliers, leaving about eighty-three cubic feet per second to be discharged into the river. The volume of the river is reported by D'Aubuisson as being about four thousand six hundred cubic feet per second; hence the sewage is diluted with about fifty-five times its own bulk. Now at a point about fifty miles below Paris the river is stated to be perfectly clear and in a normal state of purity, or, to use the words of my authority, chemically pure. If this be true—and there seems to be no reason to doubt it—it would seem that for a dilution of fifty-five, or, inverting the terms, for a degree of pollution of $^1/_{55}$, a thorough cleansing is accomplished in a run of about fifty miles at the rate of a little over two miles an hour, or in about twenty-five hours.

Using these data as we did those of the experiment already considered we have the following table:

TABLE No. 2.

Degree of dilution of sewage.	Cleansing run at the rate of two miles per hour.	Time required for cleansing.
1.30	68 miles.	34 hours.
1.40	59 "	29½ "
1.50	52 "	26 "
1.100	37 "	18½ "
1.200	26 "	13 "
1.300	22 "	11 "
1.400	18½ "	9¼ "
1.500	16½ "	8¼ "
1.1000	12 "	6 "

A particular feature in the case of the Seine, which very probably contributes considerably to the purification of that river, is that both the banks and bottom of the middle ground of the polluted reach of the stream are occupied by a very luxuriant vegetation. Now, when the efficacy of aquatic plants in preserving the purity of water in

aquaria is remembered, it should not be surprising to find a marked difference in the results of the two cases quoted; although we would scarcely be prepared to look for so great a divergence as that indicated by corresponding numbers in the tables.

The contrast between these tables and between the data on which they are based illustrates very strikingly the extremest variation of results which may arise from a difference of circumstances in problems of this kind.

In the absence of other information this contrast would be very discouraging were we not in some degree warranted in viewing the case of the Seine as illustrative, in a general way, of the self-purifying power of rivers, and possibly also, (with a large allowance, however,) of average streams in the alluvial districts of warm countries, while the experiment referred to might be taken as an extreme indication of what might transpire in the case of a polluted brook flowing through rocky defiles and uncleansed by any other than atmospheric agency, or in the case of rivers in the northernmost portions of our land. In either case, however, the tabular conclusions presented before you must be accepted with great caution, perhaps with considerable dilution, especially where they exhibit the probable times of cleansing waters which are but very slightly debased by organic impurities, for—Firstly, variations of temperature have a marked influence in accelerating or retarding the distruction of organic matter. In what degree this occurs it is impossible, in the light of our present knowledge, to say. Secondly, sewage, as usually delivered, requires a run ranging, in ordinary cases, from a few hundred yards to a mile or two before becoming well mixed with the stream which carries it. This distance is of great importance when we are considering short runs, and an allowance must be made for it in each case, depending on the location of the outfall and the width and degree of disturbance of the stream. The most practical way of applying this correction would be to make the extreme allowance for every ordinary case. Thirdly, the assumption that an increase of fresh water, (other conditions remaining the same,) will correspondingly increase the rate at which a given amount of sewage will be cleansed by it, may be an error of practical importance. The assumption is a plausible one, and yet it is possible that a finer distribution of a given amount of putrescible matter throughout a larger mass of the oxidizing agent may, by the excess of the latter, cause a more intense oxidation than with smaller quantities. But it should be remembered that if the latter is the true

state of the case, then are my tables safer than I have supposed them to be. Fourthly, the average rate of purification at given times is very uncertain. So far as I know no attempt has been made to determine it—at least, I have not met with any reference to it. I have taken it as varying with the square of the times in order to err on the safe side in the cases of the shorter runs. Judging from the experiment on which the first table is based I should think it probable that the average lies somewhere between a ratio of the squares of the times and the square roots of the cubes of the times. A third column is appended to Table No. 1, whose numbers (in brackets) are derived from the latter ratio. Lastly, the chemical constitution and the flow of sewage vary greatly in different localities, and in the same place during different seasons and at different periods of the day. This variation, especially in regard to the composition of the sewage, will necessarily be a source of great perplexity in any attempt to forecast the polluting effect which a proposed system of sewers will have on a given stream. In what is known as the "combined system" of sewerage the greatest pollution will probably be produced by short and violent rain storms during the dry seasons, by the casting of large quantities of street washings into a stream before its own volume has been materially increased. It would seem, therefore, that in such a system the storm capacity of the sewers and the average flow of the stream at dry seasons, and the chemical composition of their contents at such times, would be the proper gauges of the relative volume, of sewage and stream, and of the degree of dilution of the former. It must be evident, however, that the topographical features of the town and of the country bordering on the stream may sometimes modify the above general conclusion very materially.

In the so-called "separate system" the maximum discharge of the sewers and the minimum flow of the stream, together with a higher degree of pollution of the sewage itself than in the former case, should always constitute the basis for computing the probable dilution of the sewage.

Notwithstanding what I have said in regard to the defects of these general tables, I still believe that they may be of some service as guides for the approximate solution of problems relating to the expediency of casting crude sewage into streams of potable water, at least until we have more information in regard to the exact effects of that practice under a great variety of circumstances—provided always that due regard is paid in each case to the nature of the climate and the other

important features already alluded to. In the southern latitudes, for example, where the winters are very mild and aquatic vegetation is luxuriant wherever it finds suitable nutriment, I should be inclined to expect that the deductions from the case of the Seine, with the addition of a moderate margin for safety, would find a safe application. In the colder regions of the north a closer approximation to the figures of the first table would be more suitable, while for the middle latitudes I would be inclined to approach a mean between the two.

A means of estimating the time, or the run, needed for the purification of a stream of sewage of average quality by a given volume of water being once established, it will then be, comparatively, an easy matter to determine whether any particular water-course will afford the necessary quantity of pure water for cleansing the sewage of one of its towns before it reaches a lower one, where the water might be used for domestic purposes; or, should the minimum flow of the fresh-water current be given, and the distance in which it is required to accomplish the cleansing, then the average, or preferably, the maximum amount of sewage which would be admissible to the stream may be found by a very simple computation.

Whenever the question related to the restoration of the purity of potable waters great nicety of calculation would be unnecessary, for, as I have already intimated, a large margin of safety must be employed in dealing with problems involving danger to human life. This is especially true in the light of our present lack of specific knowledge regarding the restorative powers of fresh-water streams.

Wherever the water of the stream, in its natural state, is clearly unfit for domestic use, much of the gravity of the question will disappear. Yet even here it must be remembered that such water may be applicable, as it often is, to a great many industries, some of which might be injuriously affected by the organic impurities brought by the stream to their doors. The adjustment of such cases to the interests of all concerned would usually be more easily compassed in the case of potable waters.

Time will not permit me to enter at present into the consideration of the effects of the precipitation of the solids of sewage matters in the neighborhood of the localities where these matters originate. It is an interesting field of inquiry, covered as yet, so far as I know, by mere conjecture as to the sanitary effects of such precipitations on their immediate neighborhoods, except in extreme cases, where the accumulations of sewage matters have in the course of very many years

become sources of rank offence to the senses, and, doubtless, also breeders of disease.

The following are the points which I have endeavored to lay before you:

Firstly. That fresh-water streams have, undoubtedly, the power of destroying organic impurities which are mixed with them, and therefore that it is not, necessarily, unsafe to cast crude sewage into streams of potable water.

Secondly. That the capacity of any particular stream to effect such destruction depends on the degree of dilution of the foul matters, on the original purity of the stream and the degree of disturbance of its current, as bearing on its oxidizing powers; that it also depends on the climate and season, the character of the soil on the bed of the stream, and on the presence of aquatic plants; and finally, on the time of exposure of the putrescible matters to these reducing agencies.

Thirdly. That even the very limited number of facts which we possess in regard to these matters admit of a rough formulation, whereby questions as to the expediency of using any particular water-course as a receptacle for crude sewage may be raised out of the field of mere conjecture to a more scientific and practical plane of discussion. And in this connection I have endeavored to show how the only examples which were availabe for my purpose may be interpreted in the light of certain general principles and adapted to practical use.

In conclusion I desire to express the hope most earnestly that the institution of the National and State Boards of Health will speedily be followed by an enlargement of their powers and the placing of ample means at their disposal for the prosecution of thorough inquiries into the important, but as yet obscure matters which I have endeavored in a preliminary way to consider.

ENTERIC FEVER AND CESSPOOL DANGERS,

As Illustrated by Local Outbreaks on the Mountains, near the Sea, and in a Public Institution.

The State Board of Health, ever since its formation, has had occasion to watch with care the different forms of fevers which from time to time prevail, in order to detect their causes and the best methods to secure avoidance. It may be said of the State as a whole, that its freedom from specific fevers has been fully equal to that of most of the States.

Typhus fever, which prevails so often in the crowded cities of the old world, and which has had occasional outbreaks in this country sometimes occurred at Perth Amboy, when, more than now, it was a place for the arrival of emigrants. The outbreak of last year at Camden county alms-house was an unusual experience. It has always been recognized as a disease of personal uncleanliness and overcrowding and has oftenest had its origin in jails, in close hospitals, or in times of famine.

Typhoid fever has some points of resemblance, so much so that it was long known by the name of abdominal typhus. It has always seemed more directly traceable to the accumulation of foul animal secretions and has seemed to increase with the use of foul cesspools and sewers. Long ago it was not infrequent in New England, amid the valley towns, and in private houses was attributed to the fact that the location of outbuildings was often higher than the house and so as to contaminate wells. There is much ground for the conclusion that it arises in many cases from the dejections of diarrheal patients, or from the mingling of excretal matter with water or air. It is not usually claimed that it arises from vegetable decay, but is always associated with some abnormal animal condition.

There is often occasion to inquire whether we do not now see still another form of fever not always having the special lesion of typhoid fever, but which has many of its symptoms. This view has been so

much entertained as to lead some high medical authorities to speak of what they call a cesspool or sewer fever, seeming to arise spontaneously from breathing air or drinking water contaminated by the stored filth of human and household accumulations. We have had a class of these cases in this state and believe such a view to have some support.

The various forms of Intermittent and Remittent fevers which prevail from time to time, are not different from those familiar both to English and American practitioners, and will continue to vary in frequency and intensity accordingly as the population is subjected to the influences of heat, moisture, imperfect drainage and abnormal vegetable decay on the one hand, and accordingly as human systems by deterioration or exposure are made more susceptible on the other.

We are here to speak of enteric fever, or of that varying form known as cesspool fever, which has been illustrated the last year.

Our attention was first called to an outbreak which occurred in the Centenary Institute at Hackettstown, beginning early last January.

The buildings are finely located on a height, amid beautiful mountains and with good natural surface drainage. The care of the institution was excellent, and the general health of the pupils, until awhile before the outburst, had always been good. So soon as a few cases occurred it was thought best to adjourn the school, both that new cases might be prevented and that the causes might be diligently sought out and remedied. There were in all about thirty cases and four deaths.

The Secretary of the Board made a thorough examination into all conditions which might have seemed to excite the disease. It could not be traced to any person who had come from elsewhere and entered the school, unless it could be connected with a case of so-called malarial fever in Brooklyn. The first case had been exposed to this and was called by the same name, but afterwards seemed to be a possible nucleus of the other cases. The milk supply was chemically examined and found unobjectionable. The water was derived from the mountain and supplied the entire village, in which no cases had occurred.

The inside water-closets and other water-pipes for the removal of soiled water were not all of the best construction, and defects were found which showed that foul gases could find entrance if such were anywhere produced. The outside privies were near and had not been cleansed for several years, reliance being had on natural soil drainage. The cesspool also had been constructed so as to allow all liquid matter passing into it to pass off into the ground, and had not

been cleansed for several years. It was believed that the strata of ground would incline all flow away from the buildings, and so it was thought that the pool would be self-cleansing. Examination showed not only a cleft in the limestone bottom, but also that such a flow away from the buildings could not be depended upon. No doubt was left on the minds of those examining it, that a condition of things was found which would account for the sickness which had occurred. Various details might be recited, but they would only be a repetition of conditions before noted in the Jamesburg and Princeton epidemics. Hot-water pipes that discharged heated water into the sewer pipes may have had something to do with increasing the temperature of the sewage. The trustees delayed the opening of the institute until thorough structural alterations had been made. Many of the indoor fixtures and pipes were altered and replaced by those of more recent approval. The outer privies were rebuilt and fitted up after the trough-closet method, which, with proper cleansing, airing and oversight, is much of an improvement upon the usual school out-house. Two cesspools at a distance were substituted for the one near by, and made so to communicate with each other as to cause constant draughts of atmospheric air, and admit such examination and outflow as will prevent foulness. Although there are those who object to any form of cesspools, good authorities claim that by such an arrangement there is full protection against risk. The officers and trustees of the institute have spared no pains to correct all defects. Yet it furnishes new evidence not only of the need of vigilance, but that everything connected with large institutions, so far as the removal of all *débris* is concerned, needs to be fully known, and that structural arrangements must be such as to secure pure soil and pure air.

Soil saturation with liquid or solid refuse is never safe in the vicinage of large buildings in which many persons live. Foul air is often in winter driven therefrom by the furnace heat and dispersed through the rooms. Headaches and general *malaisé* often occur where there is no specific disease. It is only in flagrant cases or where some sickness has been introduced from without that we have these severer cases.

The other special outbreak occurred along the shore instead of amid the mountains. The following is a brief outline of it:

A fine hotel stands on a narrow strip of land, with a sea-front about five hundred feet before it and a river one hundred and fifty feet to the rear. The building was

erected about five years since, in a bed of sand, free from organic decay and with but little excavation. The water-supply was derived from Long Branch, the main pipe being extended thereto. The water itself seems to have been good. The only defect here is that, because of insufficient pressure as turned on to the water-closets, it cannot always be relied upon for flush, and so may leave the closets without full traps, or, at least, without a supply sufficient for prompt and adequate flush.

The main point was to trace what became of all the liquid and water-closet wash from the closets, the kitchen, etc. It was found that this was carried to two general soil-pipes, which emptied into two separate cesspools outside the main inclosure of the building. The soil-pipes were open on the roof, but were hermetically sealed at their exit and in their course to the cesspools. Between the cesspools and the building there was no trap and no outside ventilation. The cesspools themselves were within a few feet of the closets and one of them in an area of the inclosure. They were miserably constructed of plank and filled to the top. The planks over the top were covered with ground. When opened, we found a heavy mass at the top of mere solid filth. That near the kitchen was a mixture of grease, fecal matter, etc., quite solid and over eighteen inches in thickness. It was in a state of nauseous decomposition. Each of these cesspools had an overflow near the top, so that what did not soak into the ground might be carried into the river, adjacent. One of these was stopped up, so as to allow no outflow except such as took place from the loose tile under the ground. Any foul air from these cesspools must at times have found its way into the soil-pipes of the building, and so could flow out wherever the bath, or closet, or other connections would permit.

Fortunately there were but four or five cases of the fever, and of these none died. We had no doubt of the local character of the disease.

In both of these cases neither the mountains nor the sea are to be held responsible.

The time will never come when either on mountain or at sea, mistakes in dealing with filth will not be dangerous. It is even yet claimed by some good authorities that yellow fever had its inception in the holds of foul ships in mid-ocean.

The third instance is that of a fever epidemic which commenced in December, 1881, in the Hudson county alms-house, located high on Snake Hill. It continued for about five months. The physicians in charge of the institution regarded the cases as being of a mongrel character. We have the same testimony so often given in an outbreak of fever, dependent upon foul air generated on the premises or in the buildings. It was this that led some good authorities to designate between this and the typical typhoid fever, by calling it cesspool fever. One of the attending physicians endeavored to classify the cases as follows: typho-malarial fever, one hundred and fifty-six cases, twenty-seven deaths; remittent fever, ninety-four cases, six deaths; intermittent fever, one hundred and five cases, eight deaths.

The ground on which it was not pronounced distinctly typhoid, was that there was often absence of abdominal symptoms and that a malarial influence was manifest. Yet occurring as it did in winter, it is difficult to regard the malarial symptoms as anything more than a complication. There were many other deaths which were attributed to age or feebleness, which no doubt were hastened by or depended upon the bad local conditions. The attention of this Board was not drawn to the institution during this epidemic, but an after-inquiry into symptoms and details, left no doubt as to its pythogenic character. The crowded condition of the building, which had over eight hundred inmates, and other complicating evils, must have exposed its entire population to foul-air influences. A general condition of *malaisé* was recognized even by those who were not susceptible enough to have any severe attack. Over one hundred deaths occurred, most of them incident to this outbreak. Besides the ill adaptation of parts of the building for its purpose, its ventilation and sewerage systems are very defective. A letter addressed by the Secretary of this Board to the Clerk of the Board of Freeholders refers to it thus: "The sewage system of the almshouse is strongly to be condemned. On the inside the trough-closets and other appliances are in poor condition. The soil-pipe runs out into a great privy cesspool. Into the two privies come both this and the asylum sewage. They are too near the building, and the whole arrangement is practically wrong. All the ventilation there is opens toward the building by means of gutters, save the one soil-pipe which is ventilated on the roof but not outside the building. There is no need of any outer cesspools, as attachments to the direct sewer properly trapped and ventilated by an outer shaft would give all conveniences. Some attention needs also to be given to the general drainage of the ground here. Although elevated it is naturally wet and suffers from dampness by its relative position." Besides other sources of bad air sufficiently pronounced, the fecal and cesspool emanations could not but have permeated the building.

Thus we have had the last year three endemics of fever in very diverse circumstances as to locality, yet all in districts and positions chosen for their salubrity. They are alike in having been the victims of cesspool befoulment. If we insist upon storing the varied offalings of animal and vegetable decay, instead of removing or utilizing it, as nature has indicated, there is no mountain or hill so high and no sea air so pure that man's device may not concentrate pollution. True, the penalty does not always follow quick upon the mistake.

Nature is so grandly conservative, that she herself utilizes and amends many of our errors. Then again it often takes a union of forces to develop the result. Stored filth may not stir into disease at all if neither heat nor moisture is applied. Sometimes the depth of covering protects; sometimes its thickness and undisturbed coating makes a hermetical seal; sometimes fermentation occurs instead of putrefaction, or the mode or time of breaking up is propitious. We cannot always tell why one real case of scarlet fever is benign and another malignant, or why an epidemic of the same disease, as diphtheria, is managed easily in one house and in the other carries off a whole family group. But we do know enough to know that any system which stores filth or manufactures sewer gas, and holds these in readiness for thermal or atmospheric or personal conditions that may exist, is *extra-hazardous*. We know it is not the fault of many a household, and especially of many a crowded hotel, that they have not received any sickness adequate to their arrangements therefor. But let not the warnings we have had repeated year after year in the State be lost upon us. This variety of fever is of household origin and must have its correction or prevention by the application of well-known sanitary principles, to the cleansing or removal of all things connected with life and indwelling which are not promotive of health. While we shall never cease to make some errors, with the application of principles and methods now well understood there is no reason why typhoid fever and its allied types of disease should not forever cease to occur.

SANITARY INQUIRIES INTO THE CONDITION OF CHARITABLE AND PENAL INSTITUTIONS.

As early as 1866, in the appointment of a State Sanitary Commission, it was made a part of its duty to look after the dependent classes of various grades. In the general law of 1877, as a part of investigation and inquiry in respect to the influence of conditions and circumstances upon the public health, this Board recognized these classes as somewhat included in its inquiries. Accordingly, in the fourth report will be found a detailed account of the condition of jails in Warren, Morris, Middlesex, Essex, Union and Somerset counties. Also the record of examinations made of the Warren county alms-house, Morris county alms-house, and of the Newark city and Elizabeth city alms-houses, and a few of the township alms-houses of Essex county. Special visits had also been made by the Secretary to the county alms-house and asylum of Camden county, to the jail of Camden county and to the State Reform School, in the sanitary interests of the State. The last Legislature, by a special act, empowered the Board to inquire more fully into any State, county and township alms-house, asylum, prison, jail or other public institution, and to report upon the sanitary condition of the same. Circulars and correspondence soon revealed the fact that very different systems as to these prevail in different sections of the State. Our public institutions, viz., the state prison, the two reform schools and the two asylums are under well-known and well-organized supervision.

Essex county has a penitentiary near Caldwell, having a farm of forty acres. Work is done by the convicts—they average about one hundred and thirty in number. The institution is well conducteed and in most of its sanitary arrangements is a model.

Hudson county has a penitentiary at Snake Hill, averaging about three hundred convicts of terms of one year or less. Stone quarrying and other industries are pursued and the system is well managed. All of the counties have county jails. Most of these are connected with

the court-house and are under the supervision of the Sheriff. Those in Essex, Hudson, Passaic and Union are under the charge of wardens, and two of them are separate from the court-house buildings.

The State prison and the jails of Camden, Cumberland, Salem, Essex and Hudson counties have been visited by the Secretary of the Board and carefully inspected. Either by direct personal meeting with officers or by official letter any defects have been carefully noted and recommendations given.. Letters which are on file will show how important has been this work, and how many of these needed this kind of inspection. It is known that already some important changes have been made. It may be said once for all, as to all visits to the various institutions of a penal or charitable kind, that there has been manifested the most earnest desire to know sanitary defects and the assurance that requisite changes would either be made or fully considered.

The city alms-house of Paterson, the county jail, and some of the pauper insane were visited and examined by Wm. K. Newton, M. D., and a careful report made to this Board as to them is on file.

ASYLUMS.

Full reports were received from both of the State asylums in reply to a schedule of questions and such additional particulars given as were needed. With these full reports and the knowledge already had of the structural arrangements and sanitary administration of these institutions by the Board, it was not deemed necessary to make a more special inquiry this year. Besides a few insane or demented persons to be found in various alms-houses, there are in the State eight county asylums, in which are to be found inmates of all grades of derangement, and of all varieties of skilled and unskilled oversight.

The counties which have these asylums are thus enumerated, the number of inmates being given as by the last State tax allowance. Those which are either in a building with or adjoining the county alms-house are marked with a star.

Burlington county,* sixty-four (Pemberton); Camden county,* seventy-nine (Blackwoodtown); Cumberland county,* ten (Woodstown); Essex county, three hundred and twenty-eight (Newark); Gloucester county, three (Clarksboro); Hudson county, two hundred and twenty-two (Snake Hill); Passaic county, thirty-six (Paterson); Salem county, seven (Salem.)

These, with the average of about five hundred and fifty in the State asylum at Trenton, (thirty-seven being convicts), and five hundred

and thirty-five in that at Morris Plains, give an aggregate of one thousand eight hundred and thirty-one, of which a little over two-fifths are in county asylums. As the State not only pays an allowance for these, but also needs to recognize all as related to the social and industrial interests of the people, it has need to exercise over them some form of intelligent oversight. With the demented still in alms-houses or in private families we find an aggregate that may well attract attention in our study of the causes which improve or deteriorate population. The statesman and the citizen not less than the professional man, need to study the best methods of care and the possibilities of preventing this increasing element in our modern civilization.

In Burlington county the asylum forms a part of the alms-house with its three hundred and twenty inmates. The general care is under the special superintendence of a matron, and a physician visits the institution as often as is necessary. The cells, with the exception of three or four, are properly located.

Camden county has its asylum on the same grounds as the alms-house, but in a separate building. It, too, is under the superintendence of a matron, and has the same visiting physician as the alms-house.

Cumberland county has its asylum under the same superintendence as the alms-house, but is not as well attended to. The asylum building is adjacent to the alms-house, but because of the small number of inmates (ten), lacks that expert care which larger institutions can command. Three epileptics are kept in the other building in rooms not well adapted for them.

The asylum in Essex county is so large as to command all the advantages of skilled administration, and of those skilled in dealing with this special ailment. Although the present buildings are in some respects well suited to their purpose, as the property belongs to the city and not to the county, new buildings are being erected, which will probably be completed in about three years. There is no reason why this institution should not illustrate the best methods of alienistic care.

Gloucester county has a small brick building on the same grounds as the alms-house, fitted for nine persons, but containing only three. All bad cases are sent to the State asylum.

Hudson county has an asylum adjoining other county institutions on Snake Hill. It has a number sufficient to secure the services of a

resident physician and is in many respects managed according to the most approved methods. The new part of the building is admirably adapted for its purposes as to its halls, its rooms, its heating and ventilation and its change from sitting to sleeping corridors. In those rooms where close confinement was necessary, the contrast with some similar rooms in smaller asylums was very great. Those who in the latter always slept on the floor because of their destructiveness of beds and clothing, were here provided with a form of elevated bed which is used, so as to secure greater comfort and cleanliness. It was in marked contrast with similar cells seen at two other places.

Passaic county provides for between thirty and forty inmates.

Salem county. The asylum building is here adjacent to the alms-house. Although the asylum has but few inmates, like other small asylums it suffers for want of classification and administration. Both it and the alms-house were found so defective in many particulars, that the Secretary felt it to be necessary to meet members of the Board in person so as to complain of its condition and suggest changes. No one could thus visit the various asylums of our State without recognizing that the care of this portion of the population, either in a charitable, social or economical view, is a responsibility needing careful management. The time has come when it will not do to trust to routine methods or to look upon such institutions as only local or ndividual in their character. Two thousand such dependents as these need study as to causes, as to treatment, as to classification, as to system of provision—often quite different for the acute and chronic insane—as to possibilities of employment and amusement, and as to the relation which county or city asylums should bear to the State. While great ability of management is discernible in some of these, it s not so always. There is want of unity of system and oversight. The system of freeholder care needs somehow to be kept free from political changes. In two or three instances changes of administration have simply been the result of party changes, and all institutions of harity are imperiled by such methods. In others there is no attempt at expert management. Both charity and social economy require a more comprehensive oversight. Asylums for less than one hundred are sure to suffer for want of administrative care and of that skill which has familiarized itself with insanity in all its forms.

ALMS-HOUSES.

Great difference of method exists in the State as to the care of the indigent. Most of the larger cities have city alms-houses, whose officers derive their authority from the Mayor and Common Council. Several of the counties have county alms-houses. In other cases some of the townships combine in a common alms-house. Many townships have alms-houses of their own. Some have a system of outdoor relief, and a few still cling to the old method of farming out the paupers.

The following counties have county or township alms-houses:

Atlantic county; Bergen county, one for eight townships and one for three; Burlington county, Pemberton; Camden county, Blackwoodtown; Cape May county, Cape May C. H.; Cumberland county, Bridgeton; Essex county, city and township houses; Gloucester county, Clarksboro; Hudson county, Snake Hill; Hunterdon county, township houses, etc.; Mercer county, city and township houses; Middlesex county, city and township houses, etc.; Monmouth county, township houses; Morris county, county house, Boonton; Ocean county, mostly township houses, but some townships reserved a right in the Monmouth county house; Passaic county, county house and city alms-house, Paterson; Salem county, county house, Woodstown; Somerset county, township houses; Sussex county, township houses; Union county, city and township houses; Warren county, county house, Townsbury.

Of these, that of Hudson county is the largest, numbering between eight and nine hundred inmates. Nearly all of the county alms-houses have been visited. It has been our habit to make direct report as to all these institutions to the Board of Freeholders or persons in charge. Various matters needing attention were referred to and such suggestions were made as sanitary defects required. It was not deemed necessary to make any public criticism or even to give copies of communications in this report. This is all the less needful because in many instances prompt response has been made to these communications by structural and administrative improvements.

From various city and township alms-houses returns in answer to sanitary inquiries are on file in this office.

It is impossible to calculate with absolute accuracy the number of the pauper class as indicated by these returns. It cannot, however, fall short of from six to seven thousand. This, with a prison and penitentiary population of sixteen hundred, and a jail population of

one thousand, and reform schools three hundred and fifty, and asylums two thousand, makes an aggregate of dependent population of about twelve thousand.

Of all questions relating to methods of dealing with dependency, none are more important than those which relate to sanitary conditions. While this Board cannot with present provisions attempt a close examination of the smaller institutions, it has thus been able to extend to most State and county institutions a sanitary inquiry which, it is hoped, will be found to have been of advantage to these institutions and will help to awaken the attention of citizens in the various counties to the importance of attention to those influences which may limit dependency and crime. Not only the influence of intemperance but that of various other evils needs to be closely studied. Much is to be done not only in improving the condition of these and in diminishing their number, but in overcoming that thriftless tendency which is so apt to adhere to families or to communities.

HINTS WITH REFERENCE TO THE REGULATION OF MOISTURE IN ROOMS.

BY PROF. C. F. BRACKETT, PRES. OF STATE BOARD OF HEALTH.

I have been requested to discuss briefly the question of moisture in the air of our living-rooms, with reference to its regulation. The object which it is desirable to secure is the maintenance of such a rate of evaporation from the surfaces of our bodies and respiratory organs, as shall be requisite to keep them in proper condition for the discharge of their normal functions. Common experience teaches that very important relations exist between the temperature, moisture and other conditions of the air, and our feelings of comfort or discomfort.

The bodies of living beings, while in some respects self-regulating, are yet subject to the same laws which control the actions of matter in general. The unceasing molecular and atomic changes on which life is conditioned are productive of heat in the body, as they would be if they took place without it. How this heat is expended so as to maintain the normal temperature, which is in all climates found to range between 98° F. and 100° F., will be obvious by considering a few facts which have been ascertained by careful observation.

Under conditions ordinarily favorable to health it is found that 72.9 per cent. of the heat given off by the body escapes by radiation, 14.5 by evaporation from the skin, 7.2 by evaporation from the lungs, 2.5 by heating the air from breathing and 1.8 by the solid and liquid excreta. It is thus seen that about 22 per cent. of all the heat which leaves the body passes off by evaporation. If, now, such conditions supervene as shall tend to increase or diminish this evaporation, corresponding disturbances in the system result, and though it possesses powers of compensation which are called into action by such disturbances, their exercise may greatly interfere with our vocations, comfort and health.

Now the quantity of water which is required to completely saturate a given space with vapor is dependent upon the temperature of the space alone, it being exactly the same whether air be present or not. Moreover, the amount is, for every given degree of temperature, definite, so that having once been reached, no more can be taken up. Suppose that we are in a room whose temperature is, say, 99° F., and that the room has been supplied with all the vapor of water which can be taken up at that temperature, plainly, although the surface of our bodies as well as that of our lungs may be completely bathed with moisture, no relief from evaporation can be had. If, however, less moisture is present than is required to saturate the space, the process of evaporation will be set up with corresponding abatement of heat and relief of discomfort.

If, again, we suppose the air of the room to be perfectly dry, a condition not met with in nature but one which may be produced by artificial means, we shall experience equally disagreeable and injurious effects.

Now the atmosphere in which we live may for our present purpose be regarded as composed of two perfectly distinct gaseous bodies in a state of mechanical mixture, viz., air and watery vapor. These, like all gaseous bodies, are subject to the laws of diffusion, so that they become uniformly mixed throughout. And we may, without error, speak of the air as saturated when the space occupied by both contains all the vapor it can contain at the given temperature. Now the capacity of air, in this sense, rapidly increases with increase of temperature. Thus if one pound of air at 32° F. were saturated with moisture it would contain .00379 pounds of water. If, now, the whole were heated to 42° F., it would no longer be saturated, since at this temperature a pound of air would be capable of holding .00561 pounds. Merely heating the pound of air together with the vapor contained in it has changed its hygrometric state from complete saturation to one which is only 68 per cent. saturated. In like manner, if the temperature were successively raised to 52°, 62° and 72° F., the corresponding degrees of saturation would be 46, 32 and 23 per cent. If we assume that the temperature of our living rooms is to be maintained at, say, 72° F., our sense of comfort will depend on two factors, jointly, the warmth of the air and its condition as regards dryness. If we rely on open fires, which radiate their heat without warming the air directly, but do so by first warming the walls of the

room, which afterwards warm the air moderately, we shall be obliged to admit so much moist air from without that there will be little danger of too much dryness. But if we employ stoves the case is altered. Their more advantageous positions and dull radiations enable them to sufficiently raise the temperature without the expenditure of large amounts of fuel, and therefore with little necessity for admitting large amounts of fresh air, and it hence results that on the temperature being raised the degree of saturation with moisture falls very low and most uncomfortable dryness results. This is obviated by placing a vessel of water on the stove in such a position that it may be heated and give off vapor more or less copiously. In order to present the principles involved clearly, let us suppose we have a stove in which we have to burn 40 pounds of coal in the course of ten hours, in order to maintain a temperature of 62° F. when the outside air is at 32° F. Now 4 pounds of coal per hour will require 1200 feet of air for its combustion. This will weigh about 91.3 pounds and will contain, at 32° F., 0.346 pounds of vapor. This would be intolerably dry, for the degree of saturation would be only .23. Let a vessel of one foot area contain water and be so placed on the stove *that it will be kept at a temperature of 122° F.* This vessel will yield 0.538 pounds of vapor. We shall have then, altogether, 0.884 pounds of vapor brought into the room every hour. But 91.3 pounds of air at 62° would require for complete saturation 1.0764 pounds of water. We thus have an atmosphere too damp—about 82 per cent. saturation. If we reduce the size of the evaporating vessel one-half we shall add, other things being constant, about 0.269 pounds of vapor to that brought in from without; and secure a degree of saturation of about 57 per cent. This may be called a dry atmosphere, since it could sustain much more vapor; accordingly, every article that is exposed to it will continually give off such moisture as it may contain. The same will be more emphatically true of less degrees of saturation.

It appears, then, that with the conditions supposed we may if we would secure a moderately dry and healthy atmosphere, so place an evaporating vessel as to secure the evaporation of somewhat less than a half a pound of water in an hour, (between 0.269 and 0.5381 pounds).

This may form a basis for regulating the amount of water that is to be evaporated on stoves. If we are to consider the case of furnaces where a large amount of fresh air is to be heated and thrown into the dwelling, the case is complicated with the numerous details of con-

struction, the rate at which the air is admitted to the heating chamber, etc. No doubt the most satisfactory plan is to have recourse to observation of the wet and dry bulb thermometers, and by their indications regulate the exposed surface as to extent and proximity to the fire-pot till the proper amount of evaporation is secured.

NOTE BY THE SECRETARY.—We draw special attention to this brief statement of the vexed question as to whether water on stoves, or for furnaces, is desirable. A proper degree of artificial moisture is often needed for our comfort and health, in a stove or furnace-heated atmosphere. By an accurate statement of the problem itself, and the influence of relative conditions, we are brought to see that there is a method of quite accurate determination. In the absence of this, our only plan is to have a vessel of water such as is named; to note its temperature and the amount evaporated in any given time, and so form an estimate of the degree of evaporation most generally acceptable or desirable. This approximate indication with our feelings and sensations will often aid us in adjusting the heat and moisture of a room atmosphere to health and comfort.

LOCAL SANITARY INSPECTIONS

Of Sea-side Resorts, Etc.

BY EZRA M. HUNT, M. D., SECRETARY.

The State Board of Health has for more than a year past been making sanitary inquiry and investigation as to some of our most growing towns, with a view of informing itself of the exact sanitary conditions, and of suggesting changes to the local Boards of Health. It was thought best at first to direct more special attention to seaside resorts, because their rapid growth and the summer crowding of population especially inclines them to insanitary conditions.

It is the object of this paper to give an outline which will indicate the present sanitary status of the most important of these and a few other localities, and to point out desirable improvements. We shall not need to attempt to conceal any real defects, because the spirit of inquiry we have found indicates a desire to secure the best sanitary conditions, and because many of the suggestions made will no doubt be acted upon by the time this report is in print. The record will be all the more serviceable because by it we shall be able to point out evils and their remedies, such as are equally needed to be known by many other cities. Thus we shall hope to aid in giving direction to sanitary improvements throughout the State.

Having noted two of the most prominent seaside resorts on our more southern coast, and one of the growing inland resorts recommended for invalids, we will then turn to some of the growing villages and cities along the shore of eastern New Jersey.

As the chief design of our inspection was, first of all, to find out what city, borough or township provisions are made for drainage, water-supply, sewerage and the removal of all garbage, etc., we have first of all inquired into them. In addition, inquiry was had and examination made of various hotels, not for the purpose of speaking of them individually, but that we might know the general condition of large

buildings to which the people are invited to resort, not less in the interests of health than of general recreation. The New York Tribune, in a recent notice of healthy summer resorts, speaks thus:

"The New Jersey Board of Health has begun the examination of the sanitary condition of the seaside resorts along its coast. It is a necessary work for New Jersey, both humanely and financially. The summer boarder is now a more profitable crop in that State than sweet potatoes or whortleberries. It is a harvest which has only grown up within the last ten years, and which yields millions of capital to the Jerseyman; and it is a harvest which will as rapidly disappear if these very measures of precaution which are now inaugurated by the Board of Health are not carried out.

"From Sandy Hook to Cape May mushroom cities have sprung up, many of them under the patronage of some religious body. An enormous amount of capital has been invested all along the coast. Land which ten years ago would not sell at $5 per acre now is eagerly bought up at thousands. Even during the winter months the hotels at some of the resorts are crowded, physicians having discovered that the air of this coast is as mild and curative as that of Nice and Mentone. There is no reason why these resorts should not succeed, and the New Jersey coast prove a convenient and close sanitarium for this city and Philadelphia, but one, and that is the problem of drainage. The soil, being sandy, is porous as a sponge, and absorbs all the poisonous matter from the surface, transmitting it to the wells. The problem of proper drainage is rendered more difficult by the tidal streams which return all decomposed and noxious matter to the shores. It is a difficulty easily overcome, however, if taken promptly and energetically in hand, as the State is beginning now to do. The native population along the coast are the purely conservative kind who hold on inexorably to the pig-pens, open drains, foul smells, decaying fish and other abominations of their ancestors as to precious heirlooms. A few stringent laws will be necessary to teach them that their pure sea air is their only valuable capital, out of which they can make a comfortable living if they will keep it pure."

The rapid popularity of the coast, tempts to the derangement of its natural advantages to a degree which the hasty devices of speculation have already begun to illustrate. Here are the stipulated conditions on which some of them have already proceeded. Pay no attention to natural drainage. Make no provision for artificial drainage to compensate for structural changes. Grade and upheave, so as to ignore all natural laws. Instead of draining a pond, make of it an artificial lake. Hide the salt meadows, or the more organic deposits of higher vegetation, by sea-sand or river-mud. Build rapid cities, and notwithstanding the rapid pollution of ground, with no vegetable growth to utilize it, assume that the water will be good, because the oldest inhabitant says it always has been good. Rush in an unsettled population, which has far more complicating conditions than the sudden occupancy of a city by a great army, and gather the solid and liquid

tonnage of all excretions and offalings into cesspools, that will let it out all over the ground, only a little under, so as to be concealed from sight. Repeat this, year after year, on the hypothesis that it will take care of itself. In the absence of classified facts, assert the perfect healthfulness of the city. Do not admit that any deterioration of health from these causes can take place, unless there is a summons from typhoid or typhus fever, or some other specific epidemic, to quit. Let all the other tax on vital force and vigor count for nothing, and even if this comes, explain it away as being brought by summer boarders." This plan has been adopted in many a mountain district, until fevers have discredited mountain-air. It is still adopted in many inland towns which are not health resorts. Our coast is thus far fully on a par with other watering-places. It is only because we desire that it shall excel them, that the note of warning is sounded in time.

Of this coast, as a whole, reaching from Raritan bay to Cape May, as furnishing localities for towns, cities, and for health resorts, too much has not been said. Its location as to the great ocean, its accessibility to centres of trade, its forests and plains, its soil and climate, give facilities of adaptation, and promises of salubrity, such as will continue to invite increasing population, unless art succeeds in subverting what nature has devised. But all along, certain governing principles must be held in practical esteem. Climate and health are made up of many factors. Good locality in a temperate clime, fitness of geological structure, pure air from sea and land, and good water already determine many things in our favor. Yet these are not to be assumed to be entirely the same, even at adjacent points. Here and there changes occur in the underlying ground which must be understood. Rivers flowing toward the sea differ much as to their banks, their rapidity of flow and their deposits. Even amid wide stretches of sand and gravel, beds of organic matter are found. Water-supply differs much according to the water-shed it represents or the character of the soil through which it is drawn. Even when equally good as to healthfulness it may have taste derived from mineral or vegetable matter. Prevailing winds and the kind and extent of near forests have much to do with climate and health. So in choosing amid good localities, there is room for much variety. Again, independent of such structural arrangements as have to do with buildings, there is great difference in the preliminary or constant surface work which different localities need.

Some places are made unhealthy by the mere upturning of the soil.

There are kinds of ground, of drift material, and of rock, which, in their exposure to the air and in their disintegration, produce bad air and disease. There are meadows which ought not to be covered up, and mud of rivers which ought not to be used for filling in.

There are many places in which underground drainage is the one essential thing, before there is any building, so that a dry, well-aired groundwork can be secured.

There are other places in which the natural drainage is just sufficient, but which need additional aid in this direction so soon as buildings begin to be erected. We could point to two or three places on the coast in which there is reason to believe that excavation and imperfect drainage have already started causes of malaria, which will continue unless the evil is appreciated and the remedy applied. Yet, as a whole, the stretch of sea-coast is as free from malaria as any mountains on the continent.

Another frequent and suspicious occurrence along the shore, is the interference with natural water-courses, either by inattention to natural underground drainage, or the partial stoppage of waters in their course to the sea, by artificial ponds or lakes, or the impounding of tidal sea-water, or the mingling of stagnant fresh and salt waters, so as to make of little natural ponds a something that can be called a lake. It is not always that such lakes are a nuisance, but all such stoppage of water near its exit to the sea, is to be presumed to be an error, unless high engineering authority can show why any given case is an exception.

CAPE MAY.

Cape May, as the first important city at the southern extreme of the State, may first engage our attention. Our examination of it was made in April, 1882. It is a city of about eighteen hundred permanent population, but in summer, varies from fifteen to twenty thousand. Of its climate, we need not specify at length, since its advantages in this respect have been so often set forth. Yet it is well to note that the more closely we study its climatology in relation to disease, the more apparent is it that it has an evenness of temperature and a freedom from frost more than its latitude and longitude would indicate, and deserves, as does much of our coast line, a careful study in the interest of health. When we recently had occasion to compare data as to disease, with those of Professor Smock as to climatology,

it seemed quite apparent that a very hopeful study presented itself as to the special climate conditions of this section.

The soil of Cape May is admirably adapted for a city. It is a common fallacy that sandy soils, as being so loose and porous, are best adapted for close population. The fact, however, is, that gravelly soils are much preferable as percolators, and that alternate layers of gravel or mixed soils serve much better to dispose of organic matters that may reach the surface. The soil which underlies Cape May city is mostly gravelly, with sand under the gravel-bed, and then another layer with bay-shore gravel.

Where there is filling in, this is often done over salt-meadow land. Although this made ground, at present, makes up but a small portion of the city, and although the salt marsh is underlaid by gravel and sand, it would be wiser, in the filling in, to provide such drainage as would help to dry out this intermediate layer of organic matter, which, by the covering, becomes a subsoil too full of organic matter. The water-supply of the city is well managed and of excellent quality. It is derived from three sources: Two of these are large circular wells which go down into the gravel-bed, and are not in the same strata as most of the old wells of the town. These strata are in most places divided by a narrow strip of clay, so hard as to need the pick in excavation.

The water from the upper well is pumped up by the Holly system into the tank at the lower well, and from both there is a supply sufficient for the ordinary uses of the city.

About sixty feet from the second gravel-bed well is an artesian or bored well ninety-seven feet deep. In the boring of this, at about ninety-four feet, a cedar log was reached which had to be bored through. Just beneath this a good supply of water was secured. An eight-inch pipe leads down to this supply. The water is pumped by steam to a tank thirty-four feet high, having a capacity of sixty thousand gallons. There is also another tank with a capacity of thirty-five thousand gallons. The steam pump can raise sixty-five gallons per minute.

The water generally stands in the tube of this well at thirteen feet from the top. In very dry weather when in use it has gone down to eighteen feet, and has been pumped to twenty-two feet as the lowest. All whom I have been able to consult regard the supply as inexhaustible. The water is soft and pleasant, and quite tasteless unless a slight sulphur taste is perceptible.

We think it can be said that the city has a good and abundant water-supply. Here and there a cistern is still used, but this is scarcely needed. The poorer classes still depend upon wells which vary in depth from ten feet to sixteen feet. It is desirable to discourage the use of surface water and also to look after the abandoned wells, that these be filled up.

It is worthy of notice that one other artesian well was attempted previous to the one now in use. This was put down to the depth of two hundred and twenty-four feet, and this reached salt water impregnated with other minerals so as not to be fit for use. It is probable that the failure was owing to over-deep boring or to some change of strata. If need ever requires, it is quite probable that other artesian wells can be provided. On the whole it can be said that few sea resorts on such narrow strips of land can be found with so good a water supply.

Sewers. A careful examination was made of the sewer system of Cape May city. Some changes and repairs which were being made gave an excellent opportunity for careful examination.

The main sewers were constructed about thirteen years since and additions are from time to time being made. The city has no map of its underground structures, and like most of our cities much needs a complete sanitary map. The gradients of the different sewers could not be obtained, but there was good evidence that they are fairly flushed and that the fall is sufficient unless some special hindrance occurs. One sewer which was being taken up on account of deficiency of fall, illustrated the fact that portions are sometimes laid with too little fall. There is obstruction because there is irregularity of fall more frequently than because from "end to end there is too little fall." This sewer consisted of large drain pipe laid about ten years since. The pipes and cement were in good condition. The obstruction found had been caused by a variation in grade, which had apparently been made to suit a gas main, and only requiring the simple remedy of raising the line of pipe before it was reached. The pipes beyond this were so clean as to show a good flushing. They are all of vitrified pipe except a part of the terminus of one, which is of hemlock. The outlet of these sewers is by three distinct channels—one into Hedges' creek, quite out of the town, and the other two into Cape Island creek, not far from each other. Hedges' creek carries about two-fifths of the sewage and the other two the remainder. The whole system is between three and four miles, but accurate data are wanting.

As the emptying is into tide-water at points where the tide rises from three to four feet, the mouths of the outlets are covered a part of the time, but not so long as to interfere with frequent delivery. For this reason there should be more frequent man-holes. The sewer-pipes are from ten to sixteen inches calibre, and often unnecessarily large. They carry all the storm-water which enters by gully-traps at the corners of streets. At some of these, there is free ventilation. We think that these underground sewers should all have free access to the air by frequent openings, so that they can be flushed by the breezes, and so that sewer-gas cannot have either a place for production or for lodgment.

It is much easier to keep sewer-gas out of these sewers than it is to keep it out of hotels and other public buildings. For reasons hereafter to be given, we urge upon the Board of Health the keeping of house sewer-gas out of the sewer system, *by free ventilation of the sewers, and by intercepting all house sewers by a trap between the house and outside system, and by a ventilation either by man-hole or shaft on the house-side of the trap.* Have no conveniences for the manufacture of sewer-gas, and protect yourself from the modern-convenience plans of manufacturing sewer-gas which are mostly to be found inside of buildings. It is not only good in theory, but the best practical way, in such cities as this, of teaching householders and hotel-owners that the city has more to fear from them than they have from the city.

The garbage of Cape May city is carefully excluded from sewers, and seems well removed by those living at a distance whose interest it is to remove it fresh for use. Yet it is well for all local Boards to have the mode of removal under supervision, and subject to ordinance, if need be.

We now come to speak of the conditions of hotels and residences, as related to outside sanitary conditions.

We find at Cape May the structural provisions for water, for disposal of sewage, and for all that relates to outside sanitation, either good or capable of easy correction, and a Board of Health which comprehends its work far better than is usual. The chief lack is in the sanitary inspection and fitting of buildings—a lack common elsewhere, but especially needing attention at summer resorts. Buildings occupied but part of the year are especially exposed to insanitary disorders. Water is drawn off, so that all traps are emptied or left imperfectly sealed by foul water. The buildings thus become ventilators to the sewers, while the few that remain to care for them are usually totally

ignorant as to what constitutes sanitary care. Rats and rust do their work on the pipes. Thus walls are saturated with bad air, and no building is fit to be used, unless a *sanitary expert* and *an honest* and capable plumber have thoroughly examined it before re-occupancy. This is especially true if it has patent tubs, patent water-closets, and all the modern conveniences. We have examined here and elsewhere, many a hotel, in which the chief evil arose from the fitting up of its artificial systems. With such water-supply and delivery as Cape May possesses, and such sanitary care of buildings as might be had, it ought to be a health resort equal to any in the States. There is little danger from sewer-air in Cape May, save such as is made in the buildings. It will not be made or kept there, if thorough cleanliness is preserved, and if the machinery for indoor appliances is not as it usually is, defective. Although we have the record of facts in detail, we do not propose to speak of any hotels by name, either here or elsewhere, since they are so much alike, and since so many of them need some alterations, or the skilled oversight of a sanitary engineer. In many, traps are defective, fixtures are rusty and leaky, workmanship about them is imperfect, ventilators are not carried to the roofs, and there is no outside man-hole or other disconnection so as to allow all inside pipes to be flushed by currents of air. Even the school or trough-closet might, in many cases, well replace more elaborate constructions. The pan-closet, as we find it in most hotels, is very objectionable. It is not worth while to be fitting up contrivances which complicate and then call them health-preservers. These do not often originate specific diseases, but if such happen to be introduced from other places, these unfavorable accommodations provide for the extension and multiplication of cases. The principle which should apply to all inside conveniences where the delivery is by water-carriage, is that of regulated flushing by air as well as by water.

It is for this reason that with the exception of a single trap in the house to each basin, closet, etc., and one outside of the house and beyond an air opening, modern sanitary engineering is adopting fresh air as a disinfectant and discarding many of the artificial complications. If the Boards of Health of our summer resorts could, in addition to general oversight, have a skilled inspection of all hotels and boarding-houses early enough each season to secure right structural conditions, such places as Cape May could be even more fully guaranteed as to health and comfort. As it is, we find the Board of Health of this city intelligent as to its duties and efficient in its work.

Cape May Point is located about two and one-half miles from the city. It has no sewer system, but a water-supply similar to the gravel wells of Cape May. It is at present a healthy resort, but if growing, will still have to settle some questions of health care.

ATLANTIC CITY.

This growing summer and winter resort has a constant population of about seven thousand and claims a summer population of sixty thousand, more or less. It foundation is upon sand. This, in modern times, is not unsafe unless it leads to the false view that everything that soaks into the ground keeps on going in, and so will remove itself without any plan or aid from man. Mere strainers do not dispose of organic matter if it is very abundant. The present water-supply of the city, with the exception of a few wells, is by cisterns. These are mostly built above ground or only partly beneath it, and made of brick and cement. There has been some complaint that when not well protected they absorb gases, but in general the people regard the supply of water as good. This opinion is not so fully shared in by visitors. A company has been formed to supply the city with water from what is said to be an unexceptional source on the mainland—the pipes are already being laid. We think there is much need for this improvement, and that a full supply of good water is needed from a reliable and unfailing source. Next to this, cisterns properly built and properly cleansed are reliable. The city has no sewer or water-carriage system and does not at present contemplate one. The reason given is that it is difficult to obtain sufficient fall, and that they hope to be able to manage other systems. How to do this after water is introduced is not so clear. Now that one million of gallons of water can be raised a foot for about nine cents, we do not need to consider lowness of grades as an objection where there is an ocean or large creeks for discharge. No city on the coast can better afford to devise and execute a system in accord with the best sanitary engineering. The storm-water is partly conveyed off by wooden conduits which run out and discharge upon the meadows. The city will yet have to choose between a sewer system or an increase of filth. Fecal matter is mostly received in privies either above or below ground, according to the fancy of the owners. Two odorless excavating machines owned by private parties serve for the cleansing. While there are some rules as to emptying, and while complaints are heeded, there

is not such an administrative system as would be approved in any city of efficient sanitary police. In one hotel where a water-carriage system had been arranged, the management was anything but satisfactory. It is not impossible that the dry system might be a successful one. It can only be so where the form and condition of privy vaults and the modes of removal are regulated by ordinance and enforced by a sanitary inspector or police—with the most rigid accuracy—or conducted by the city itself.

The dry system as here attempted, leaves a large amount of liquid slops, kitchen drainage, wash-water, etc., to be disposed of by other methods. This is generally received into open cesspools, and what does not get out into the sand is carted off in wagons to a meadow, a mile from the city, where it is from time to time imperfectly composted. The carting is done by individual arrangement. Some avoid this by a succession of two or more cesspools and a more general discharge into the ground. Some of the residents speak with great confidence of the power of this loose sand to dispose of all liquid refuse. One of the most prominent physicians said that the soil is so loose that all liquid refuse is sure to percolate through the soil and find its way to the sea before any harm could be done. While, therefore, believing in general removal, he did not think a sewer system required, or that cesspools would do harm in this city for the next thousand years. Notwithstanding this, we found pits where bath-water without grease did not drain off from shallow vats, and where cesspools were full to the top with liquid filth. Grease tanks were not generally in use. While a method of interrupted irrigation might be practicable if done on a system, we failed to see that by any cesspool system, the ground could be permanently relied upon for safe disposal.

The garbage is disposed of by contract to parties who collect it, it is said in an unobjectionable way, and carry it in sealed packages or donigans to the country. The two districts into which it has been successively carried for the last two years, have protested, and now it is delivered to a market-gardener near Haddonfield.

In individual cases, we found great attention being paid to sanitary conditions—in some with measurable success—in others with great failures. The Board of Health is earnest in its endeavors. Public sentiment and the new Board are now attempting the solution of sanitary problems for which the present provisions are inadequate. The absence of structural arrangements for delivery can only be

compensated for by excellent administrative skill and oversight of cruder methods. Until this is reached, it is hoped the city may continue to realize its boasted salubrity. But with a great present and a hopeful future, it cannot afford to run risks which two or three English coast resorts on the sand did run and received the results.

VINELAND.

(Examined April 18th, 1882.) Vineland is a beautiful borough, in the township of Landis, Cumberland Co. The township has six thousand inhabitants. Although not on the sea, it is a favorite resort. Dependence for water-supply is upon wells, from twenty to thirty feet deep. The natural springs and water-bearing strata give a good quality of water. As it is not easy to secure any other water-supply except by cisterns, it is very important that the soil be kept free of all organic matter. Cesspools and privy-wells are too common. The cellars are, some of them, damp, notwithstanding the natural dryness of the soil. Many of the houses and stores are very close to the ground, so as not to give facilities for the ventilation of cellars.

The High School building is, in many respects, a model, and much attention is given to its sanitary condition. We visited a shoe and hat factory, in which there was evident effort to secure sanitary advantages for the workmen.

The borough, for riddance of all refuse, both liquid and solid of all kinds, stands much in need of a complete system under exact sanitary police. We think too much has not been said of the many advantages of Vineland. But we also think that until public opinion supports an efficient Health Board, and consents that all cesspools and privy-vaults, and their mode of emptying be regulated by some law, and put under the oversight of a sanitary inspector, the town will not, infrequently, have wells affected by organic matter, and the air of some of the houses not be as pure as it should be. Wells should be properly made, the upper parts cemented and raised above the ground, so that there should be no surface drainage toward them, and then the ground should be kept clean. This means that no refuse should be placed deeply in it, or be long heaped upon it, or be let to run into open cesspools, but rather that all offaling should be so distributed as quickly to aid plants, or else be carried away for more extended irrigation or composting. Since the examination made by the Board, public spirit has been greatly aroused, and no city of its size is more fully

comprehending or urging on requisite sanitary arrangements. We next pass to the more northern and eastern coast of the State, as next to the sea resorts already noticed, the most populous district.

The examination of the region known as the Highlands, so far as it is being largely occupied, shows the importance of taking full advantage of sanitary science and art before there is more rapid increase of population. In much of the excavation and filling up, there is need of close study of drainage. Already, some malaria has developed which is not natural to the locality. We have visited three of the localities to the north of the Hotel Bellevue—but, as they are comparatively new as summer resorts, we leave details as to them for a future report. As to all localities that are fronting the Sandy Hook peninsula, the owners should early settle as to permanent sources of water-supply, and the methods for delivery of sewage. The present use of Shrewsbury river as an open sewer-main, or the interposing of cesspools for occasional emptying into it, may not, as yet, affect the air or the stream. But close engineering and sanitary examination as to its capacity, its flow, its deposits, and its availability, present and prospective, should not be delayed. This is much better than false security on the one hand, or than those wild and denunciatory sanitary booms which break forth sometimes from a very little occasion by way of New York or Philadelphia. The vicinity of the Hotel Bellevue, while offering many advantages, illustrates how various hotels and localities near by must settle this question. As in another article we notice the outbreak of fever last summer at this point, we need not dwell upon it here.

Sea Bright, as a favorite locality near this, has already the water-supply of Long Branch. Many of the hotels and private cottages have appreciated the importance of early sewage delivery, or where compelled to use some form of cesspool have closely examined into methods. Much attention has also been given to adequate house plumbing. But the want of system of close house-to-house inspection each spring and fall by a local Board of Health, or by an approved expert, and the tendency there is to use cesspools, and to adopt devices sometimes more original than competent, needs to be carefully watched. Here, as elsewhere, it is the right of all those who stop at large hotels or summer boarding-places to have the sanitary conditions duly certified by something more than the earnest, and often honest but mistaken assurance of the proprietor. The same legislation which in cities, marks tenement-houses and emigrant-houses extra-hazardous, and passes

special laws as to them, should not overlook these public houses which crowd with inmates, and have often better facilities for reception than they have for the safe delivery of all contents. In all places where no sewer system has been adopted, it seems to us that the regulation of house sewage and all closets should be committed to a responsible local government, which should secure all necessary uniformity and insure healthful methods. While there has been much unintelligent assertion as to insanitary conditions, there is, and always will be, need of constant supervision in order to preserve for this coast its well-known salubrity.

LONG BRANCH.

The soil of Long Branch is mostly of clay, gravel and sand in successive layers. The general contour of the land is favorable to drainage, to which, however, little attention has been given. Not far to the rear of the sea-front there is a depression or small valley, through which a natural brook runs. Not only should this be kept entirely clear of all possible pollution, but in places the ground immediately adjacent to it should be drained and filled in. Instead of this there have been here and there removals of ground, so as to increase the overflow. Here, as in other seaside resorts, there is need of caution as to the causation of malarial disease by the careless handling of the earth in embankment, etc., and by imperfect drainage or the ponding of water at locations where there are no indications for artificial ponds. All local Boards of Health should have in thought and plan these questions, which are deeper and broader and more essential than to find out some special nuisance. It is for this reason that sanitary maps are very desirable which shall show the character of the soil, the natural water-courses, water-sheds and ponds, which shall note and record all underground structures, and show not only contour and topography, but in covered structures give the depths, gradients and other varied information such as is needful where questions of improvement or as to drainage, sewerage or structural conditions may arise. No place on the shore should be without a complete sanitary and contour map.

Water-supply. The general depth of wells is from ten to twenty feet, the water in some being soft, in others hard. Long Branch, however, has what seems a good water-supply from a brook about two miles distant, the water being raised to a reservoir and from thence distributed to the hotels and to most of the cottages. This fortunately

insures the people against the drinking of soil contaminations. It is not, however, so abundant as to warrant a supply for too many adjacent places.

Sewerage. Long Branch has as yet no system of sewerage. As a consequence, the cesspool system largely prevails. The methods are under the control of individual owners, except where the Board of Health has occasion to make complaint. The consequence is that the provisions are good, poor, bad or outrageous according to the conceptions of proprietors. In one case we found an ingenious device by which all slop-water is pumped up from a close tank daily, and flows by proper pipes to an iron perforated box several hundred feet out to sea. The plan seems thus far successful. The fecal refuse is voided in dry vaults, in which sand is plentifully used twice per day.

The garbage runs down a shoot into a brick white-washed vault, where it is received in a wagon and carted away. The whole plan is that of daily removal of everything except the privy deposit. This is treated on the earth-closet system on a large scale. At this hotel the remains of abandoned cesspools were both instructive and comforting.

Here and there, along the shore we found cesspools for filth storage of all kinds and degrees as to locality, numbers, and size. In one case, four in a row beginning near the house, and one receiving the overflow of another, while all allowed soakage into the ground. Three privy wells in succession did the same thing. In another case, the chief privy cesspool was only a few feet from the closets and the overflow cesspool a little further off. We saw one after another of these cesspools varying in degree and in badness according to the inventive arts of various proprietors. Most of them were of brick or of plank, and all provided for soakage. The boast of the landlords always was, that they are cleansed before hotels open each season, and that they are well covered during all the summer. Intermediate ventilation between those slop-ponds and the indoor arrangements was found to be the exception—pan-closets were used in most of the buildings. While we can conceive that under excellent management, these cesspools may be prevented from causing an outbreak of disease, and may be tolerated, yet we were glad to find many of the proprietors urging upon us the advocacy of a water-carriage sewer system. The time has passed when the leaky cesspool for towns and hotels system can be sustained. A sewer system is greatly needed at Long Branch, and, until provided, it is greatly to the interest of those who entertain summer visitors to provide a method of riddance similar to that to which we have at first referred. We are glad to know that the people

are aroused, and that the risks of last summer will not be repeated. Until some general system is adopted and a sewer system fully adequate and properly built is provided, there will be all the differences which individual management can devise. West End was found in its arrangements entirely similar.

No examination has yet been made of Elberon. Its relations of soil and water-supply are much the same, and its proprietors seem determined to secure for it the best sanitary advantages.

ASBURY PARK.

Asbury Park is located on a sandy soil, "with an underlying stratum of clay varying from seven to fifteen feet beneath the surface. The clay-bed is from three to seven feet in thickness, and is underlaid by a stratum of gravel." Ten years ago it was woodland, the forest being of pine and oak. It varies from a population of two thousand in winter to twenty thousand or more in summer. This fluctuation has great advantages and disadvantages, since it gives opportunity for important changes a part of the year, and by the sudden influx often causes evils that may be only in part incident to the locality.

The city ought not to thrive without a perfect system of sewerage and water-supply, and a method of sanitary inspection thorough and frequent. It has the advantage that it is largely controlled by a gentleman who is active and powerful in its sanitary interests, and by a Board of Health which secures sanitary administration. Its sewer system, now embracing over nine miles of pipe, discharges, by means of an intermittent tank, at a proper point into the ocean, and is flushed by waters from the lake. It needs close attention as to grade, and flush, and ventilation, but most needs a more universal connection of all permanent buildings with it. Strict ordinances are adopted and enforced as to the construction of privy-vaults where allowed, and cesspools are discouraged. The overflow of these vaults is into the sewer system. Deep drainage is being looked after at needed points. Surface refuse is looked closely after. Yet, such places cannot be too much impressed that summer success depends on such active, sanitary policing as prevents any accumulation of filth.

Wells are still depended upon, but it is expected that a water-supply will be speedily secured. Water from the soil cannot be permanently depended upon here. In the excavations and changes taking places the need of additional drainage cannot be overlooked, especially as holes or ponds are often made by careless removal of ground. It

is hopeful that its future is recognized as demanding important improvements.

One of its Health Board has recently said that if not another building should be erected for the next year, and the time be spent in putting all the property in the borough in perfect sanitary order, it would be a profitable investment for the future.

OCEAN GROVE.

Ocean Grove depends, for its water supply, on driven wells and lake-water. Like some of the other coast cities, it will need, in the near future, some other form of supply. It has a sewer system which delivers into ill-constructed tanks, but, before another season, some changes will probably be made.

The system of water-closet disposal is varied, and depends too much upon the will of each family, except where the nuisance becomes flagrant. The town should ultimately adopt either a public system of weekly dry removal, or connect all closets, both indoor and out, with a sewer system.

Ocean Grove is so much a camping-place for the summer, that to the parts thus occupied the strict rules of military sanitary police should be applied and executed by an inspector constantly on duty.

The system of garbage hogsheads in the form of cesspools should be entirely broken up.

Both examination and reliable testimony of residents and sojourners have satisfied us too much deference is paid to piecemeal plans and suggestions by those who, although very able in their respective callings, are not to be relied on in either sanitary construction or advisement. We expect to see this excellent location improving rapidly in sanitary methods and discipline, as well as in numerical prosperity.

Ocean Beach depends on driven wells for its water-supply, some of which are good and some of them poor. It has no sewers and its cesspool systems are objectionable. This fine locality ought, by sanitary improvements and administration, to be placed on a sanitary basis. At present every man doeth what is right in his own eyes.

New Brighton has not as yet developed any adequate system.

Spring Lake receives its water supply from the lake, which is a natural one, and which is carefully guarded from contamination. It is much superior to most of the seaside lakes, but it remains to be seen whether it will be sufficient and unexceptionable as there is increase and closer proximity of buildings. Most of our seaside resorts greatly

err in that all questions of water connection, sewage, etc., are not, from the start, regulated by ordinance. There are a few wells in use. The principal hotel carries its slop-water and liquid refuse by pipes to an inlet from the sea, where it has a satisfactory discharge. The privy vaults are well managed on a dry-closet system, the vault being high and easily accessible for the addition of dry earth or for removal. Some of the cottages depend on cesspools. It would not be difficult to arrange a system which would include all present buildings and serve as a plan for future additions.

Sea Girt. The soil is clay, gravel, clay and sand in successive layers. That part of the place nearest the Tremont Hotel depends upon driven wells about twenty feet deep and the water seems to be of an excellent quality.

The hotel has a combined privy and slop-water system with discharges into a wooden tank so carried out to the sea as to be satisfactory. The reliance for internal ventilation is upon a chimney. Most of the cottages depend upon cement vaults and dry removal, and upon cesspools for slop disposal. While we do not find any positive sources of evil at present, yet we do find want of uniformity of administration and absence of structural arrangements such as the patronizing public will ere long demand. The time is not far distant when it will not be sufficient for a proprietor to show his own admirable, unique and original contrivance, or for an association to pass rules and leave the administration to each owner. We were glad to find just one large establishment which had the whole building subjected to sanitary examination each year, in order to insure the perfect repair of every fixture and skilled examination of every contrivance. That part of Sea Girt represented by the Beach House has a natural well twenty-five feet deep of good water-supply.

The water-closet and slop systems are united and carried off by glazed pipes with intervening man-holes, in which there is a small settling basin and a trap made by the mode of inflow and exit. The waste goes finally to a distant wooden cesspool in the sand, designed to allow the liquid to soak away into the ground at a long distance from any dwelling. The plan answers well where there is only one building under good administration. Cottages are compelled to depend on systems of their own. The sewage was formerly carried into a stream, but those in the neighborhood of Squan raised such objections as to lead to the distant cesspool system. We found good fire escapes here, in which some of the hotels are very deficient.

Point Pleasant was not closely examined, but information as to its water-supply and sewerage shows it to be of much the same character as that of Bay Head.

Bay Head. The soil here is more largely sand than in the vicinity of Spring Lake. As the town extends, much salt meadow will be covered and its proper drainage should precede this. The present dependence for water-supply is upon cisterns or driven wells, which vary much in depth and quality.

The association controls the kind of privy-vaults and secures regular removal. The slop-water disposal depends upon cesspools. Here, too, there are important sanitary questions to be settled, to which expert attention is already being given.

In all these towns where no sewer system prevails, all depends upon a general system of ordinances, and their enforcement under the direction of a competent and honest sanitary inspector.

After a careful examination of some of the most prominent of our seaside resorts, we do not find sufficient ground for many of the extravagant and sensational reports which have been made. We do see many defects, but generally just such as are to be found in every summer resort which has grown into such rapid prominence as to lead to careless construction and arrangements. The most discouraging cases have been those where a local Health Board is unwilling to recognize real defects, and hopes to cover up negligence by boasting. A single year of adequate sanitary work, would place these resorts upon such a sanitary footing as a proper vigilance could easily maintain. Much defect arises from bad housekeeping, for which the keepers of hotels and boarding-houses are responsible. Buildings are not put in sanitary order as they should be at the close of each season. The thorough fall house-cleaning is often omitted, and the landlords either shut up all but their own apartments, or haste away with the boarders. Cesspools and outbuildings are left to be emptied just before the opening of the next season. All this work should be done in October or November, and only the necessary remainder be left for repetition in the spring. Visits made by us in April and May fully exposed some of these errors. If the advice of this board is heeded, as we believe it will be, the condition of our sea-side resorts will be greatly improved before another season, and our State as well as the especial localities share the benefit of a large influx of visitors, many of whom become permanently identified with the interests of the State.

SANITARY INSTRUCTIONS IN SCHOOLS.

Report of a Committee of the N. J. State Board of Health.

LABAN DENNIS, M. D., Chairman. FRANKLIN GAUNTT, M. D.,
EZRA M. HUNT, M. D.

In pursuance of a plan agreed upon by the State Board of Health, for securing in the public schools throughout the State, more adequate attention to instruction in physiology, hygiene, and sanitary science, with reference to the ultimate health and well-being of all the children and youth, and so, finally, of the whole population of the State, Drs. Dennis, Gauntt and Hunt were appointed a committee to look after this subject, and press it upon the attention of the authorities in charge of the educational affairs of the State.

The committee issued the following circular:

CIRCULAR AS TO SANITARY INSTRUCTION AND TRAINING IN SCHOOLS.

At its last session, the Legislature of the State of New Jersey, in Chap. CLXV., Sec. 2, enacted the following provision:

And be it enacted, That the State Board of Health shall be directed to confer with the trustees of the State Normal School as to definite instruction to be given in the practical care of the health of teachers and pupils, and as to provisions for such instruction.

At a meeting of the New Jersey State Board of Health, held at Trenton, the subscribers to this circular were appointed a committee to endeavor to secure in the public schools of this State such instruction in physiology, hygiene, and sanitary science and practice as shall most efficiently carry out the objects for which the Board was established, viz., the health, the happiness, and the prosperity of the people of the State. To this end, we appeal most earnestly to all who are interested in the educational work of this State. State and local Boards of Education, trustees of the State Normal School, of colleges, academies, seminaries, and of local districts, State, county, and city superintend-

ents, principal, and teachers in all our institutions of learning, are asked to consider most seriously, and aid most effectually in instituting and carrying out a scheme for such instruction as we have indicated.

We would call your attention to the fact that the primary object of the public school system of the State is to secure good citizenship. There can be no complete citizenship without a knowledge of and obedience to the laws of one's own being and the laws of society—civil, sanitary, and social. With these, it is safe to say, we shall secure among all classes of the community the best health, the highest productivity—moral, intellectual, and physical—and the greatest amount of well-being and happiness. We would remind you that, hitherto, the laws of one's own being and those of communities, constituting the great body of facts known as hygiene and sanitary science, have been very much neglected in the usual course of public instruction in this State. Thus the young have been permitted to grow up exposed to all the dangers to life and health which follow inevitably the disobedience of Nature's laws.

Is it not practicable that some of the time now spent in teaching branches of knowledge indirectly or remotely serviceable to the learner, might, more profitably to the pupil and to the State, be devoted to imparting such knowledge as must needs be practically useful every day and hour of one's life?

Is it not equally evident that the kind of knowledge which contributes directly to the maintenance of health and vigor of body and mind, the prolongation of life, and the fullest development of all the faculties in a complete and perfect manhood and womanhood, must be second in importance to none other?

If this be true, is it not equally clear that instruction in such should be as systematically and thoroughly given in all grades of schools, as upon any other subject? Admit these propositions and you will agree that we need to modify, as speedily as possible, our scheme of education.

It need hardly be said that the change, to be effectual, must be radical. Teachers must be, themselves, taught. Should not the Normal School begin this work soon and thoroughly? Teachers' Institutes should make it a prominent part of each meeting. State, county, and city Superintendents should unitedly bring to bear all their influence to secure it a place in the regular course of study in the schools under their charge, and to stimulate the teachers to give their best efforts to make it as thoroughly practical as it will be intensely interesting when

properly pursued. Boards of trustees, upon whom now devolves the duty of determining the studies to be pursued in their respective districts, should at once take steps to introduce this, the most important of all, into the course, and by faithful oversight see that it is adequately and properly taught. Not by occasional lectures here and there before bodies of teachers, not by bits of advice to pupils on the part of well-meaning and well-informed teachers can this work be properly done, but only by systematic, oral, and text-book instruction, as faithfully and persistently pursued as possible, and adapted to the ages and capacities of the pupils. It need hardly be said that the subject is broad enough and deep enough to engage the profoundest thought of the foremost scientific minds of the world; yet its facts are the facts of every-day life, many of them so simple, so clear, as to be readily taught and practiced.

With this instruction, so adapted to all ages and capacities, we would combine physical exercises, varied, beautiful, and practical, fitted to develop the bodies and strengthen the minds of the growing pupils. Thus they will secure, as the limited time they have been under training will allow, knowledge immediately serviceable in the battle of life, and bodies well fitted to put it to practical use.

The board will cheerfully furnish names of text-books suited to various grades of schools, by means of which a beginning in these subjects may be made, and when once introduced the demand for adequate instruction will, as in England, produce multitudes of works, from which the teacher may select those best suited to inculcate this needful knowledge, and to train pupils in its practice.

Trenton, August 21st, 1882.

L. Dennis,
F. Gauntt,
E. M. Hunt,
Committee.

Copies of this circular, besides being distributed to school officers, were sent with a note soliciting earnest attention thereto on behalf of the committee, to each member of the State Board of Education, the Trustees and Principal of the State Normal School and the State Superintendent of Public Schools.

In order to be able to answer more fully and intelligently inquiries as to text-books and other apparatus suitable for carrying on this work, the circular note herewith appended was addressed to all the prominent educational publishers in this country advertising works

on anatomy, physiology, hygiene, sanitary science and gymnastics for schools.

GENTLEMEN—The committee of the State Board of Health issuing the accompanying circular, desire to call your attention to the last paragraph thereof, and would be pleased to examine specimen copies of your publications on physiology, hygiene, gymnastics and sanitary science for schools, with reference to a recommendation of the best for use throughout the State.

Yours respectfully,
L. DENNIS,
Chairman.

The responses to this note were very general and entirely satisfactory, as showing liberality on the part of publishers, and a most creditable exhibition of material excellently well suited to all the purposes of instruction in these subjects, from the primary school to the college. A classified list of those received is herewith given, with the name of the author and publisher, and a very brief mention of some of the points of value in each. We have examined likewise a number of English works the text of which is often excellent, having been used in some cases as the basis of our own. In fullness and perfection of illustrations our publishers take first rank. Special mention should be made of the work of Mrs. Charles Bray, "Physiology for Schools," published by Longmans, Green & Co., London, as a very readable and instructive book for teachers of primary classes.

ANATOMY, PHYSIOLOGY, AND HYGIENE.

PUBLISHER.	TITLE.	AUTHOR.	REMARKS.
Am. School Book Co., St. Louis..	First Lessons in Physiology	C. L. Hotze	A good work for beginners.
D. Appleton & Co., N. Y.	Physiology	M. Foster	A science primer to be read to beginners.
" " "	Physiology and Hygiene	T. H. Huxley and W. J. Youmans.	A most excellent book for students somewhat advanced,
Clark & Maynard, N. Y.	" "	J. C. Hutchison	A very suggestive and valuable book.
Eldredge, & Brother, Phila.	Anatomy, Physiology, and Hygiene	J. C. Martindale.	A clearly-expressed, compact work.
J. L. Hammett, Boston	Outline Physiology	A. F. Wood	A summary for children under twelve.
Harper & Brothers, N. Y.	Physiology and Hygiene	J. C. Dalton	An excellent work.
H. C. Lea, Phila.	Anatomy and Physiology	H. Hartshorne	A very good book for advanced students.
J. B. Lippincott & Co., Phila.	Second Book on Anat'y, Physiology, and Hygiene	C. Cutter	Enriched by comparisons with all animal life. Teachers should consult this.
Porter & Coates, Phila.	School Physiology	R. J. Dunglison	Full of good things, clearly expressed and well illustrated.
G. P. Putnam's Sons, N. Y.	Animal Physiology	J. M. Fothergill	A good book for beginners.
" " "	Elements of Animal Physiology	J. Angill	A clear, concise, and serviceable book for middle-grade pupils.
" " "	Animal Physiology	J. Cleland	An admirable work for advanced students.
Sheldon & Co., N. Y.	Hooker's New Physiology	W. Hooker and J. A. Sewall.	Style easy, natural, and attractive.

HYGIENE.

PUBLISHER.	TITLE.	AUTHOR.	REMARKS.
P. Blakiston, Phila.	Healthy Homes	G. Wilson and J. G. Richardson.	Full of excellent material for the teachers and pupils.
" "	Bible Hygiene	A Physician	A summary of the health-hints of the Bible, and other authorities.
" "	School and Industrial Hygiene	D. T. Lincoln	Full of good counsel for teachers.
Macmillan & Co., N. Y.	First Lessons on Health	J. Berners	A manual of simple instruction for the young.
G. P. Putnam's Sons, N. Y.	The Maintenance of Health	J. M. Fothergill	A most valuable work; should be in the hands of many teachers and parents.
P. Blakiston, Phila.	Easy Lessons in Sanitary Science	J. Wilson	A manual of practical hints.
G. P. Putnam's Sons, N. Y.	Hampton Tracts for the People	Various Authors.	Full of excellent advice and instruction.
" " "	First Book of Knowledge	F. Guthrie	A compend of information about materials used in arts and manufactures, incidentally helpful in teaching sanitary science.

GYMNASTICS.

PUBLISHER.	TITLE.	AUTHOR.	REMARKS.
Cowperthwaite & Co., Phila.	Vocal and Physical Training	L. B. Monroe	Particularly adapted for chest and voice culture.
E. Steign & Co., N. Y.	Hand-Book of Calisthenics and Gymnastics	J. M. Watson	A complete manual on elocution and gymnastics, well illustrated and admirable.
" " "	Manual of Calisthenics	"	Selected from the above.
Van Antwerp, Bragg & Co., Cin.	Manual of Free Gymnastic and Dumb Bell Exercises.	J. H. Smart	Well adapted for beginners.

SECRETARY'S SUMMARY OF REPORTS

FROM LOCAL BOARDS OF HEALTH, WITH EXTRACTS AND COMMENTS.

The following townships and cities have either in this or previous years notified us of the formation of local Boards of Health under the law of 1880, or its supplements.

ATLANTIC COUNTY.

Absecon, Atlantic City, Buena Vista, Egg Harbor City, Egg Harbor Township, Galloway, Hamilton, Hammonton, Mullica and Weymouth.

BERGEN COUNTY.

Englewood, New Barbadoes, Saddle River, Lodi, Palisade, Union, Midland, Ridgewood and Washington.

BURLINGTON COUNTY.

Beverly City, Bordentown, Burlington City, Chester, Chesterfield, Cinnaminson, Easthampton, Evesham, Little Egg Harbor, Lumberton, Mansfield, New Hanover, Northampton, Pemberton, Randolph, Southampton, Springfield and Washington.

CAMDEN COUNTY.

Camden, Centre, Delaware, Gloucester Township, Gloucester City, Haddon, Merchantville Borough, Stockton and Winslow.

CAPE MAY COUNTY.

Cape May City, Cape May Point, Lower, Middle and Upper Townships.

CUMBERLAND COUNTY.

Bridgeton, Deerfield, Fairfield, Greenwich, Hopewell, Landis, Maurice River, Millville, Stoe Creek and Vineland.

ESSEX COUNTY.

Belleville, Bloomfield, Caldwell, Clinton, East Orange, Franklin, Livingston, Millburn, Montclair, Newark, Orange, South Orange and West Orange.

GLOUCESTER COUNTY.

Clayton, Franklin, Greenwich, Glassboro, Harrison, Mantua, Monroe, West Deptford, Woodbury and Woolwich.

HUDSON COUNTY.

Bayonne, Harrison, Hoboken, Jersey City, Kearny, North Bergen, Town of Union, Union, Weehawken and West Hoboken.*

HUNTERDON COUNTY.

Delaware, East Amwell, Franklin, Frenchtown Borough, High Bridge, Holland, Kingwood, Lambertville, Lebanon, Raritan, Readington, Tewksbury, Town of Clinton, Union and West Amwell.

MERCER COUNTY.

Chambersburg, East Windsor, Ewing, Hamilton, Hopewell, Lawrence, Princeton, Trenton, Washington and West Windsor.

*NOTE.—The Hudson County Board of Health has general jurisdiction, and these are only auxiliary thereto.

MIDDLESEX COUNTY.

Cranbury, East Brunswick, Monroe, New Brunswick, North Brunswick, Perth Amboy, Piscataway, Raritan, Sayerville, South Amboy, South Brunswick and Woodbridge.

MONMOUTH COUNTY.

Asbury Park, Eatontown, Freehold Township, Town of Freehold, Holmdel, Howell, Manalapan, Marlboro, Matawan, Millstone, Neptune, Ocean, Ocean Grove, Raritan, Keyport, Shrewsbury, Red Bank, Upper Freehold, Wall and Manasquan.

MORRIS COUNTY.

Boonton, Chatham, Chester, Dover City, Jefferson, Mendham, Morris Township, Morristown, Mount Olive, Passaic, Pequannock, Randolph, Rockaway, Roxbury and Washington.

OCEAN COUNTY.

Berkeley, Eagleswood, Jackson, Lacey, Plumsted and Stafford.

PASSAIC COUNTY.

Acquackanonck, Manchester, Passaic, Paterson, Pompton, Wayne and West Milford.

SALEM COUNTY.

Lower Alloway's Creek, Lower Penn's Neck, Mannington, Pilesgrove, Quinton, Salem City, Upper Penn's Neck, and Upper Pittsgrove.

SOMERSET COUNTY.

Bedminster, Branchburg, Bridgewater, Franklin, Hillsborough, Montgomery, North Plainfield and Warren.

SUSSEX COUNTY.

Andover, Byram, Frankford, Greene Hardyston, Montague, Newton, Sandyston, Sparta, Stillwater, Vernon and Wantage.

UNION COUNTY.

Clark, Cranford, Elizabeth, Fanwood, Linden, New Providence, Plainfield, Rahway, Springfield, Summit, Union and Westfield.

WARREN COUNTY.

Allamuchy, Belvidere, Franklin, Frelinghuysen, Greenwich, Hackettstown, Hardwick, Harmony, Knowlton, Lopatcong, Mansfield, Oxford, Phillipsburg, Town of Washington and Washington.

All of these are organized under the more recent laws, except Camden, Newark and Plainfield, which make report, but still act under their respective charters.

We thus have had, in all, reports from two hundred and thirty-one local Boards of Health, which, although differing much as to their efficiency and as to their reports, have done much in the care of the public health.

The few townships that have not formally organized, should remember that, in case of any nuisance or any sudden outbreak of disease, the citizens will have ground of complaint, if there has not been such organization as will admit of ready service. Although in townships, each new township committee does not need to re-organize in form, there should, at least four times a year, at regular meetings, be inquiry as to health matters and attention to special causes for action, as may be needed. Those townships which have not formally organized their Health Boards, nevertheless, can be compelled to act as such under Chap. CLV., Sec. 3, 1880:

3. *And be it enacted*, That in each township of the State outside of city limits, the township committee, together with the assessor and the township physician, if there be such an officer, shall constitute the Board of Health for all of said township outside of any city limits, and shall have the same powers as are possessed by any city Board of Health within the State, so far as they could relate to any unincorporated district.

The following suggestions are made to local Health Boards:

SUGGESTIONS TO HEALTH BOARDS.

In addition to other directions, to be found in this and other yearly reports of the State Board, it may be added—

I. Let each township committee, at its usual meetings, when the assessor is present, sit also as a Health Board and enter the fact in the township health book, together with any item of business.

II. Whenever new officers are elected, there should, at the first meeting, be an entry in the health book of the names of the Health Board as thus made.

III. Where there is no township physician as a member of the Board, some of the Boards have invited some adjoining physician to act as their adviser, but it is better to elect a medical member.

IV. Carefully examine all laws relating to the construction of local Boards and their duties. Correctness and promptness of action are most important. The failure of a law is oftener in delay or mistakes in its administration, or in technical errors, than in the defects of the law.

V. The reports of the State Board of Health, as sent, are not the property of individuals, but of the Board. The keeper of the town health book should keep control over them, and see that when loaned to others, they are returned to him, and passed over into the hands of the succeeding officer.

VI. We ask the same promptness in future annual reports as in these, and that the few who have failed to organize, or to make full report, will fully arrange at the first meeting of the township committee, and notify us.

VII. As the returns of marriages, births and deaths so much indicate the progress and health of communities, and are essential in the study of local conditions, all Boards should insist upon prompt returns, and report to the Secretary of State any omissions. It is, too, the legal right of every citizen to have such a record. Any neglecting returns are liable to suit at law.

VIII. All communications should be addressed "State Board of Health," or "Bureau of State Vital Statistics," State House, Trenton.

IX. You need carefully to consult the references contained in this report to laws, circulars, etc. While the supplement of 1881, Chap. CLV., does not repeal any part of Chap. CLV., Laws of 1880, yet as Sec. 5 more closely defines the methods of summary proceeding, it is best for city and borough Boards of Health, and also may be well for township,

to adopt ordinances in accord with the supplement and publish the same. And it is always at the option of a Board of Health and a question of advisement whether to proceed by complaint before a grand jury and by the common law as to nuisances, or by seeking injunction, or under special acts. When the nuisance is of such immediate peril as to require summary abatement, these special laws are directly applicable.

See, also, Circular XXI., Fifth Report (1881), pages 184–188.

We do not need, this year, to repeat the names of all Boards which have reported, but shall make a summary or selection only from such as refer to points of especial public interest. In some cases, for brevity, only the substance of the report is given and not the exact language.

ATLANTIC COUNTY.

ATLANTIC CITY. - *Report from* THOMAS MCGUIRE, *Secretary.*

The water-supply is chiefly by cisterns, although we have an abundance of water introduced from the mainland.

The drainage is done chiefly by eight sewers, running across the city and emptying into a drain on the meadows, provided for that purpose. Council is now preparing to build one or more sewers of brick and stone clean across the city. The low lots are being filled up to city grade.

We continue to dispose of our garbage and effete matter the same as last year, viz., by shipping it to the farms on the mainland. The most important function of the Board of Health is that concerned in the investigation and suppression of nuisances, which come under their notice frequently, many of which are of a complicated nature, involving patient investigation and assiduous care in their management. The time has arrived for energetic measures, and the city government and property-owners feel their responsibility; the city government has made liberal appropriations for the improvement of streets and sidewalks; the property-owners are paying more attention to, and are busily engaged in, filling to grade low lots. More attention is being paid to drainage, and, if things go on as commenced, I am satisfied that there will be great improvement in this city and surroundings by another year. There does not seem, nor has there been during the season, any prevalent disease. We have had but few deaths since my last report. We have not only good water in our cisterns, but an abundant supply of good and pure water from the mainland, which is a great convenience and a protection against fire.

HAMILTON. - *Report from* D. B. INGERSOLL, M. D., *May's Landing.*

The report complains that, while the law as to vital statistics is well complied with, physicians are not accurate enough in stating the cause of death. Also, that there is need of a more stringent law regulating practice, so that only those who are regularly graduated shall practice, and mere time of practice shall not be a test.

The report adds, We would also call your attention to the fact that the law requires the Board of Health to abate nuisances, without giving them the means to do it. Thus, if it notify the owners of land to abate a nuisance detrimental to the health of the people, or they will proceed to do so and charge to owner, where will the pay come from, if the owner refuses to pay? or where can we procure funds to conduct a suit for damages? We think some legislation in this direction is called for.

We cannot but again call your attention to the evil to the youth of our land, and we may truly say the growing evil, because of the use of tobacco in its various forms, entailing, as it does, upon the future men and women all the terrible consequences of this habit. We think that legislation should be recommended by the State Board of Health to prohibit its use or sale to those under a certain age.

Other reports of the county note no special defects and no unusual sickness.

BERGEN COUNTY.

ENGLEWOOD. - - - *Report from* J. W. TERRY, M. D.

There can be no doubt that the malarial diseases prevalent in the lower parts of the town are largely, if not exclusively, due to the low, imperfectly drained meadow-land lying by the side of the railroad, and extending to the Hackensack river, and known as "the swamp." A dam across the mouth of Overpeck creek seriously interferes with the natural drainage of these meadows, as also does the railway embankment with the low lands lying directly to the east of it. A petition, signed by a large number of prominent citizens, is now before the Court of Common Pleas for Bergen county, asking for the drainage of these meadows, under the provision of the State law of 1881.

There is no general system of sewerage in Englewood, although there are a few lines which give relief to a few localities—the principal one, about two thousand feet long, runs from the corner of Engle

street and Palisade avenue, through the latter street to William street, and thence to Overpeck creek at the Englewood avenue crossing. The prime necessity, however, without which little can be done in the way of sewerage, is a main sewer or canal, to serve as an outlet from the town to tide-water, and into which all lesser sewers can empty.

SADDLE RIVER. - *Report from* JOHN E. KIPP, *Dundee Lake.*

The report notices a much less prevalence of malaria than the previous year.

UNION. - - *Report from* G. K. ALYEA, *Rutherford, N. J.*

Have had but one case of small-pox, provided for by the Board of Health. Every person willing to submit has been vaccinated. There was vaccination of children, by order of the Board. The spread of small-pox, during last winter, was no doubt checked by this timely provision. Only three persons died.

BURLINGTON COUNTY.

CHESTER. - - *Report from* WM. NEWTON STOKES, M. D.

The report notices a decline in the malarial fevers which had occurred during a former year, although many cases had occurred in adjoining townships near the river. Moorestown, both because of its porous and absorbent soil and its high elevation, had good drainage and usually excellent healthfulness.

CAPE MAY COUNTY.

CAPE MAY CITY. - *Report from* C. S. MAGRATH, *Cape May.*

In relation to drainage and sewerage: Much has been done the past year towards perfecting the drainage facilities of the Island, and about $15,000 have been expended by the corporation alone. The defects of sufficient fall in some cases have been remedied, and in others, sewer-mains have been enlarged and extended. A few cases of sickness, traceable to the defects in the sewerage and undrained area under one of the large hotels, have been reported, and measures at

once adopted for remedying the same. The prevalence of malaria, which has attracted so much of public attention to our summer resorts, has, by no means, been strikingly noticeable here, the total number of cases reported not exceeding half a dozen.

(As the water-supply and sewer-system is described in another connection, we do not need to quote the rest of the report.)

MIDDLE. - - - *Report from* S. H. TOWNSEND, *Sec'y.*

The only nuisance reported to the Board was the county jail, situated at court-house. The ventilation from the privy became clogged, and the four inmates became sick or nearly so. The chairman of the Board notified the committee on public buildings (freeholders) to have it attended to immediately, which was done, and now it is all right.

CAMDEN COUNTY.

CENTRE. - - - *Report from* F. E. WILLIAMS, M. D.

Malarial fever is noticed as having been somewhat in excess the last year.

HADDON. - - *Report from* J. STOKES COLES, *Haddonfield.*

There is a custom quite generally followed by persons building new houses in Haddonfield, of having stationary wash-stands and water-closets in their houses, which, together with the pump-trough, drain into wells from twenty to sixty feet from the house; the privies also have wells. As our drinking water is derived almost entirely from wells, there will surely be trouble in the course of time, unless people are *compelled* to have *cemented* sinks which can be emptied as occasion requires. So far the drinking water of Haddonfield has been excellent.

GLOUCESTER.—There has been an unusual prevalence of malaria in this township, especially in the vicinity of some stagnant ponds.

CUMBERLAND COUNTY.

FAIRFIELD. - - - *Report from* DR. S. M. SNYDER.

An extended account is given of an outbreak of typhoid fever affecting four members of one family, the first occurring in a girl who

was first sick two weeks in Camden. No local cause is known, and it is claimed that the family had before shown a strange predisposition to fever.

ESSEX COUNTY.

BLOOMFIELD. - - - *Report from* J. K. OAKES, *Sec'y.*

The prevailing diseases are the various forms of malaria from July 1st, 1881, to July 1st, 1882. No especial sickness from July 1st, 1882, to date. Whilst making the above statement of diseases we consider our town more healthy and less subject to malarial fever than some of our neighboring towns in this county.

We are expecting next year to have the aid of an association recently formed for the improvement of the town, who, by making suggestions and counseling with the Board, may help us in the abatement of nuisances and thus improve the health of the place.

EAST ORANGE. - - - *Report from* JOHN L. ROBERTS.

There is no public drainage system. The Waring system is used in some private places, which seems to work satisfactory. Brooks are not used for sewage matter, but once in a while we catch a pipe running in and stop it.

MILLBURN. - - - *Report from* ISAIAH WILLIAMS.

There have been some complaints from individuals against what is called Condit's pond, also the head-waters of what is called Factory pond. Dr. Whittingham sent a communication in reference to the former to the Board of Health, but three members refused to organize as a Board of Health in order to consider it. There has been no meeting of the Board of Health this year. Cause, as above. I make this sinple statement because I look upon it as a duty.

It is the purpose of our neighbors, Springfield township, to endeavor to have a law passed at the next session to abolish Factory pond—straighten and widen parts of the Rahway river. This is an improvement I endeavored to interest the people in over ten years ago. It is without question a matter of very great importance to the health of a large district, embracing a part of three townships.

ORANGE, - - *Report from* T. W. HARVEY, M. D.

The Board of Health for the current year is constituted as follows: Geo. H. Hartford, Mayor; Aldermen, Wm. Wang, Chairman, Christopher M'Cullough, James Young; Wm. M'Chesney, Health Inspector; Thos. W. Harvey, M. D., City Physician and Secretary.

The Board of Health have little to add to the report of last year. The regular inspections have been made as usual; every year less difficulty is met with in persuading citizens to keep their premises in order.

We have had our usual difficulties with the small brooks running through the town; although the discontinuance of the use of the brooks as sewers for cesspools and vaults has ameliorated their condition to some extent, they still receive a great deal of refuse that cannot be prevented from flowing into them until there is provided an efficient sewerage system.

The water-supply question is rapidly approaching solution. There has been organized a Water Board, which has given out the contracts for the city, and for making the necessary reservoirs, &c.

The source of supply is the west branch of the Rahway river. The water is to be taken at a point where the supply from a water-shed of five square miles can be collected in a large reservoir. The water is to be conducted by iron pipes around the mountain to the city limits, a distance of six miles, by gravity. The water-shed is one particularly well fitted to supply pure water. The soil is rocky, the land principally used for grazing purposes and thinly populated. The water comes, principally, from the trap-formation, and the stream is free from factories and other nuisance-breeding establishments. The steps that led to the present condition of affairs, are interesting.

In the autumn of 1878, an organization was formed, called the "Citizens' Health Association of the Oranges, Bloomfield, and Montclair." Its objects were, the spreading of information about, and exciting an interest in sanitary reform among the people of this section. Its operations were confined mainly to Orange and East Orange. It lived two years, and when its mission seemed fulfilled, it died. Its work, however, lived after it.

During these two years, it had frequent meetings, and was addressed by many speakers well known in sanitary circles, on the subjects of water-supply, sewerage, and of house sanitation. Its committee on water-supply during its study of this problem, discussed the following sources of supply:

1. That Orange, in common with the other towns, should take its supply from the Passaic at Little Falls.

2. That the city should be supplied by the driven-well system (under the Green patent) from a low part of the town, northeast of the city proper.

3. That shallow wells should be sunk in the same neighborhood, and that a reservoir be formed from whence the water could be pumped to a stand-pipe.

4. The Peckman river, a tributary of the Passaic, between the first and second mountains.

5. The west branch of the Rahway in the same valley. These sources were studied carefully, and propositions were received from engineers for obtaining a supply from some of them. But the minds of the people were not yet awake to the necessity.

In the winter of 1880, the New England Society joined the Health Association in the agitation of the subject. In the summer of 1880, appeared the advertisement of the sale of the charter of an old water company. This attracted the attention of the gentlemen who had been on these committees, and they bought it in, and formed the Orange Water Company. This company now took up the question in a more practical manner, and at the end of a year, presented a proposition to the authorities of Orange and East Orange, to supply them with water from the west branch of the Rahway if the two towns would guarantee a certain income by agreeing to hire a given number of hydrants. If only one town could accept their proposition, they proposed to obtain their supply from wells, until they could afford to go to the Rahway. These propositions created a great deal of discussion, and at a public public meeting held a month or two later, in Orange, it was determined by the town authorities to appoint a committee to see if there were not other sources of supply. This was the first move made by the authorities of Orange, for several years, in the matter of water-supply.

This committee accordingly worked over the same old ground, and in addition it was suggested to them to obtain the water from one of the brooks running down the east side of the mountain. This seemed so feasible and so cheap that the committee reported in favor of it, and the Common Council submitted the question of bonding the town for water works to the people at a special election. Water carried the day.

This gave the city government the first opportunity that they had for spending any money in the investigation of the subject. The

committee again took up the subject, this time with the advice and assistance of capable engineers, and they reported a second time in favor of the present scheme. A Water Board was accordingly organized, the bonds issued, and the matter awaits now the decision of the courts as to the water-rights and privileges.

In East Orange, in the meantime, the proposition of the Water Company has been accepted. They have nearly all their pipes down and expect to pump water through their pipes by the 15th of October. Their source of supply is a series of wells in the eastern part of the township.

During the year the Orange Memorial Hospital completed their new building. It has a capacity of forty beds. The plan is as follows: A brick administration building three stories high. The first floor has committee, consultation, operating and dining-rooms and a pharmacy. On the second floor there is a children's ward, a gynæcological ward, private wards and a matron's room, with bath-room, &c. The third floor is devoted to the nurses and servants and storage, with an available ward if it is needed. Connected with the main building is a two-story wooden pavilion, with a male ward below and a female ward above. This building has a capacity for twenty-six beds. It also has nurses' rooms on each floor and bath-rooms and water-closets, with accident ward on the first floor.

The kitchen is a one-story wooden addition to the main building, connected by a corridor. On the same lot is a dispensary building, a dead-house, a laundry, and an isolated pavilion.

The medical staff consists of eight attending physicians and a non-resident house physician. The nursing is in charge of a trained nurse, under whom are the pupils of the training school recently established in connection with the hospital.

During the last twelve months, many patients have been treated in the hospital, and in the outdoor department.

The chief work accomplished by the Board of Health this year has been the following ordinance:

A further supplement to an ordinance entitled "An ordinance establishing the Board of Health of the town of Orange," approved May twelfth, eighteen hundred and sixty-five.

Be it ordained by the Common Council of the city of Orange, as follows:

1. Every physician, or person acting as such, who shall have any patient, within the limits of said city, sick with scarlet fever or

diphtheria, shall forthwith report the fact to the Health Inspector of the said city, together with the name and age of such patient, and the street and number (or other location) of the house where such patient is being treated; and, in default thereof, shall forfeit and pay twenty dollars for each and every such offence.

Passed July 10th, 1882.

HORACE STETSON, *City Clerk.*

Approved July 12th, 1882.

GEO. H. HARTFORD, *Mayor.*

The following circular was issued:

ORANGE BOARD OF HEALTH, July, 1882.

DR.........................

DEAR SIR—Your attention is respectfully called to the following ordinance, passed at the last meeting of the Common Council:

A further supplement to an ordinance entitled "An ordinance establishing the Board of Health of the town of Orange," approved May twelfth, eighteen hundred and sixty-five.

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Passed July 10th, 1882.

HORACE STETSON, *City Clerk.*

Approved July 12th, 1882.

GEO. H. HARTFORD, *Mayor.*

When the Health Inspector has received the notice he will notify the Superintendent of Public Schools that the house reported is infected, and that no pupils from the infected house must be allowed to attend school until the house is reported free from disease by the medical man in charge or by the Health Inspector. In this way it is hoped that we may remove one of the most active agencies for the spread of these diseases.

Arrangements will also be made with the teachers of private schools

by which they shall receive information of the existence of these diseases among their pupils.

It is earnestly hoped that the medical profession will assist the Board of Health in their efforts to restrict the spread of these diseases in our midst by sending their reports to the Health Inspector as soon as they have cognizance of any cases of these diseases.

Blanks will be furnished by the Health Inspector upon which to make returns, and may be obtained by application to him by mail.

By order of BOARD OF HEALTH.

During the autumn of 1881 we had a great many fatal cases of diphtheria. During the four months ending December 30th there were twenty-one deaths; since January 1st there have been eleven deaths—most of these occurred during May and June.

From February to August we had scarlet fever prevailing. In many cases there was great malignancy. There were in all thirty-three deaths. It prevailed chiefly in the crowded neighborhoods and on the low grounds where the mechanics and laboring classes live.

Of typhoid fever we had very little, four fatal cases during the year.

Respectfully submitted,

THOS. W. HARVEY, *Sec'y*

SOUTH ORANGE. - - *Report from* A. A. RANSOM, M. D.

Have moved a large dam early in the spring, letting the water in branch of Rahway river flow through and not back up in the village. It was done under the State law.

GLOUCESTER COUNTY.

GLASSBORO. - - - *Report from* JOHN E. PIERCE.

It had eleven cases of small-pox and found it necessary to build a small-pox hospital.

GREENWICH. - - - JOHN STETSON, *Paulsboro.*

The slaughter-house in Paulsboro is situated within one hundred yards of the main street, and is surrounded on all sides by dwellings.

It is in contemplation to thoroughly drain the main street in Paulsboro. There is a marked improvement in the sanitary condition in our township during the past year by the abatement of nuisances under legal notice and inspection.

MONROE. - - *Report from* J. G. EDWARDS, M. D.

The principal diseases are consumption and malaria. The latter was almost unknown till within the last two years, and during last autumn it assumed such alarming form as to cause the local Board of Health to take active measures in sanitary precautions.

Consumption is the most prevalent of all human diseases, and each year it claims its annual holocaust of victims, and its prevalence does not seem to depend upon hereditary influences.

The principal vocations of industry are glass-blowing and sewing. The women engaged in city sewing on their machines suffer from this disease very much more than the males in glass-blowing.

HARRISON. - - *Report from* E. D. DE GROFF, M. D.

The report says there has been an increase of malarial diseases in Harrisonville, although it is not attributed to the mill-pond near by. A nuisance caused by a slaughter-house was, on complaint, abated.

A contagious disease among poultry has proved very fatal.

HUNTERDON COUNTY.

WEST AMWELL. *Report from* GEO. H. LARISON, M. D., *Lambertville.*

The general health has been good, except in one mile of the township which borders on the Delaware river. Here, nearly every one within a third of a mile from it has had chills and fever.

LEBANON. - *Report from* A. T. BANGHART, *Glen Gardner.*

Refuse is very carelessly thrown in the streets and not very far from the dwellings. Excreta is not properly disposed of, and disinfectants not generally used. Privies in the towns of Glen Gardner and Junction are not in as cleanly a condition as could be desired. In both places malaria and typhoid have existed to a greater extent

than ever before. Its cause, considering the high and healthy location of the country, is difficult to ascertain. (!) Complaint has been made that a mill-race running through the town, has been used as a place for depositing refuse and excreta by those residing along its banks. Most of the cases are near it, except at Junction, where physicians are at a loss to give any solution of the problem.

Six cases of typhoid fever occurred near White Hall, in a family named Tiger (farmer); three deaths resulted. Cause was found in the stopping up of a sluice-way running from the house. Near the mill-race spoken of at Glen Gardner, three cases; one death just occurred, two others now convalescing. Some cases of malaria, not considered dangerous, accompanied by chills, now exist. Was very healthy during the summer. The deaths referred to have all arisen since July 30th, but township, generally, has not been so unhealthy as it was during the last year.

EAST AMWELL. - - *Report from* P. C. YOUNG, *Ringoes.*

The report mentions malarial fever as still quite prevalent; also, epidemics of measles and whooping cough and isolated cases of dysentery. Thus, there was considerable sickness, but very few deaths.

KINGWOOD. - - *Report from* H. P. SHAW, *Kingwood.*

Many cases of dysentery are reported.

MERCER COUNTY.

TRENTON. - - - - *Report from* WILLIAM CLOKE.

Since the formation of the new Board under the law of 1880 and 1881, it has successfully carried through one great sanitary improvement of decided importance. A fetid and sluggish bayou of filth, two thousand four hundred feet in length, called Petty's Run, had for years been a reeking pest spot in the northeastern part of the city. The new Board has taken this resolutely in hand and secured its complete abatement. It next proposes to address itself to another part of this same run, west of the canal, which has also been for many years a pestilential and disease-breeding nuisance. The water-power nuisance, consisting of the sewage and filth-polluted raceway of the Trenton Water Power Company, which winds for nearly

a mile through the thickly populated part of south Trenton, has also been taken in hand by the Board with promising results. All those who drain or sewer into this stream have been notified to cease doing so, and those who refuse will be prosecuted. Nearly all who have been notified signify their willingness to comply with the orders of the Board. The Water Power Company itself has been notified to abate the nuisance already existing in its race-way, and it promises promptly to do so.

The Board is very much gratified with the results thus far achieved, and with the cheerful and prompt way in which the citizens comply with the requirements of the code, and try to co-operate with the Board in cleansing and improving the sanitary condition of the city. The Board has not yet taken up the question of sewerage, as that is now being considered by the Common Council, which has appointed a special committee on the subject.

CHAMBERSBURG. - - - *Report from* H. R. HAVEN.

Water is supplied from the city of Trenton water works, but some wells are yet in existence which have been detrimental to health. Some persons owning wells have turned them into cesspools, which has contaminated the water of others. Several cases of typhoid fever have originated from this cause.

Surface drainage is now relied on, but we find that the surface of the borough is so level, that sooner or later, some other system will have to be adopted. Malarial fever has not been as prevalent as last year.

HIGHSTOWN. - - - - - *Report from* W. W. SWEET.

The report alludes to the supply of a hotel and of some houses by a spring, cisterns connected therewith being used. Also to some interferences with natural drainage. Eruptive diseases have been remarkably prevalent, such as measles, chicken-pox, and small-pox. The form of the cases of small-pox seems to have been of the hemorrhagic variety, last year noted as occurring at Rahway and Egg Harbor City.

MIDDLESEX COUNTY.

NEW BRUNSWICK. - *Report from* T. L. JANEWAY, M. D.

Only about one-third of the city is sewered, and this system, as stated in last year's report, being constructed on the defective princi-

ple of having its outlet in the slack-water of the Delaware and Raritan canal, is to be considered as more prejudicial than advantageous. Other portions of the city are entirely dependent upon surface drainage, the gutters, the streets, &c.

MONMOUTH COUNTY.

ASBURY PARK. - - *Report from* H. MITCHELL, M. D.

The sewer system in Asbury Park has stood the test of another year, and has served its purpose satisfactorily. Improvements are in progress calculated to make the outlet into the sea more durable, and also to further ventilate the street-pipes.

Garbage has been removed from the borough, and treated, during the past summer, in a manner entirely satisfactory to the Board. Water-tight barrels were substituted for wagon-boxes for the collection and transfer of garbage, and it was carried through the streets without spilling. It was deposited in pits four feet deep and four feet six inches wide, and these covered, daily, with earth. The site selected for depositing the garbage is not near any water-course, and is about three miles from our borough limits.

Excreta is removed with sufficient neatness and decency. It is placed in air-tight barrels, and its removal creates no nuisance in the borough, though the manner in which it is deposited (about two and a half miles from our limits) has caused complaint.

FREEHOLD. - - - *Report from* H. B. COSKILL, M. D.

The report gives interesting details of cases in which vaccination prevented small-pox, and of two cases in which children who were vaccinated two days after the eruption in the case of their father, and who contracted the disease, but had a mild varioloid in consequence of their vaccination.

FREEHOLD BOROUGH, - - *Report from* C. F. RICHARDSON.

The abundance of iron permeating our subsoil does much to render harmless the impurities filtering into water.

The average distance of water-closets from the wells is too small to insure perfect safety, but it is only a question of time when the disinfecting powers of the ground will become materially weakened. In

some few cases kitchen sinks, &c., are connected with outside cesspools, but generally the slops are allowed to wander at will.

During the year the town has been visited by small-pox, six cases in two houses, without fatal results.

Immediately upon the appearance of the first case, a system of house-to-house vaccination was effected by this Board, at the expense of the town, which resulted in the vaccination of about 370 persons, about 245 of whom took successfully, and we believe there is not now a more thoroughly vaccinated town in the State. To this the faithful care of the attending physicians, and the vigilance of this Board, can be attributed the speedy and complete stamping out of the disease.

The report also contains a statement as to a case of flagrant nuisance which the Board had to abate, and for the six dollars expended, they sued the owner. The case went against the Board on the ground that the plaintiff had not been notified to attend. This and another case are being fully presented to proper legal examination. Unless some technicality embarrasses appeal, the principle involved will soon be tested, or if not in this case, by some other which may arise.

OCEAN GROVE. - - - *Report from* A. E. BALLARD.

There is a system of sewer pipes, reachable from all the main avenues, and extending with the increase of population, made of twelve and fourteen-inch terra cotta, cemented at the joints, emptying into vaults of from forty-eight to sixty feet in length, sixteen to twenty in width and depth, upon the shore, made of plank, with open bottom, covered first with plank and afterward with sand, with ventilating shafts supplied with fire near them, opened usually on Saturday nights, and oftener, if required, and washed out by the sea. No sickness has been attributed to the drainage of sewage—no malarial fevers have originated here. There has been no interference with the natural water-courses, except to give them more perfect outflow into the ocean, and to admit, at will, the ocean into them. The general ideas of the State law as to drainage are carried out, and there is a regular map of the system of sewerage. The stream which fills Wesley lake does not carry any sewage after it reaches the Grove. Above that place there are two barns and a few people along its edges, where sewage to a considerable extent enters it. Plans are being prepared to remedy this by laying a large iron pipe or constructing a closed wooden way for the passage of the water beyond the limits of

the population. By the frequent letting in of the sea into the lake, it is believed that no evil results have followed from the outside sewage so far.

The sewer system has been extended during the past year at a cost of between three and four thousand dollars, and ninety-one connections have been made. The cost of taking away the garbage, over what was allowed by the farmers, has been twelve hundred dollars, and vault-cleaning, fifteen hundred. A plan is now under consideration, for the coming year, to carry the sewer pipes to a common centre on the ocean front, at a point equally removed from the bathing-houses, and carry the pipes out into the sea beyond the breakers, without the intervention of shore vaults.

OCEAN. - - - *Report from* GEO. W. BROWN, M. D.

Refuse which accumulates in the streets in the township, generally does not amount to much, merely a few leaves, &c., but in the villages, we are sorry to say, it is too much neglected. Our streets, in the village of Long Branch, are watered during the summer months, and, in the fall, we find them literally "water-soaked." Then, after one or two storms, together with the falling leaves and other refuse, which are not properly carried away, we have, through the main street especially, about four to six inches of nasty, bad-smelling mud, which is very apt, with occasional rains, to last for weeks at a time. We have had some malarial fever here, and this, I think, is partially the cause of it. I do not think the streets are properly cleaned by the proper officers more than once or twice a year.

The township Board of Health is the only one in the township, and this is governed entirely by the State laws. The Board is still in its infancy, this being the first year of our organization, but we feel that the township has already derived great benefit by having such a Board, as the complaints against nuisances have been quite numerous, and all have been promptly attended to and abated, some of which have existed for years previous.

The report also notices other defects, but as active measures have been taken, we believe they will soon belong to the past.

RARITAN. - - - - - *Report from* S. V. ARROWSMITH.

Small-pox occurred in the centre of the town of Keyport. Proper quarantine of the whole block was instituted. The Physician of the

Board was directed to visit all the schools within the town limits, both public and private, and to make an examination of all children in attendance as to the necessity of vaccination, and, by a resolution, excluded all who did not bear satisfactory evidence of protection, until vaccination should be attended to. As a further precautionary measure, five hundred copies of the small-pox circular No. 2, as published in the State yearly report, containing precautionary instructions, were procured, and freely circulated throughout the town, a copy being placed in the hands of each family.

The disease, in both cases, assumed the most virulent hemorrhagic form, and on April 1st, the case which first developed—that of Mrs. C.—ended fatally. The other, that of Miss C., though of the malignant type of so-called black small-pox, succumbed to the treatment and recovered.

The vigorous action of the local Board, though condemned by a few, was generally approved by the public, and resulted in confining the disease to the house in which it first originated.

UPPER FREEHOLD. *Report from* JOS. HOLMES, M. D., *Cream Ridge.*

Malarial fever is reported as the most prominent disease of the past year.

SHREWSBURY. - - *Report from* RICHARD A. SICKLES.

The report shows that there has been much discussion over alleged sickness at Red Bank. There were some cases of fever, either of a severe remittent or typhoid type, but the locality is one naturally healthy. The objections in Red Bank and some other parts of the township, are the too near proximity of wells, privy-vaults and cesspools. If the Board of Health is well sustained by the co-operation of citizens, the good reputation of the locality can be easily maintained.

MORRIS COUNTY.

CHESTER. - - - *Report from* W. A. GREEN, *Chester.*

The springs are exceptionally good: I can now recall but a single exception. This spring is so situated as to receive the surface drainage, and furnish the water used by eight or ten families, in all of which a relaxed condition of the bowels has been apparent; whether

this pathological condition depends upon the continued use of this water as its exciting cause, or other filthiness, not prepared to say. The cisterns throughout the township are in a bad condition, the leaders have no turn-offs to convey away the first rain-falls, and consequently whatever organic or other impurities are deposited on the roofs are washed into the cisterns; this evil is almost universal. A great many cisterns are constructed altogether under buildings, and are entirely excluded from the air; some are never cleaned, others very seldom, while a few are carefully cleansed twice yearly. In most, if not in all cases, the pipes through which the water is drawn are lead. I do not know of a single instance where cast-iron pipe is used. A very few cisterns have filters, or rather, I should say, apologies for filters; for they are nothing more than a tin, zinc, or galvanized-iron receptacle filled with charcoal and gravel, through which the water passes as fast as received, and this gravel and charcoal are never replenished.

To report all the defects in drainage, natural and artificial, would perhaps require something to be said of nearly every house in the township; so, therefore, a single case to the point must suffice as a general exponent of what really exists to a greater or less extent throughout the township. Last summer, a year ago, I was summoned to attend a family composed of seven members, all of whom were stricken down by a low form of typho-malarial fever—the typhoid element markedly predominant. I at once began an examination of the premises to ascertain, if possible, the cause of this sudden and terrible outbreak. I found a well six feet from the back door, between which and the house milk-pans and kitchen utensils had been washed, and the waste-water, beside other slops and wash-water, had been thrown. From the well came a stench too horrible to describe. At this time, the water was so low the bucket would not fill. The water, however, had been used by the family until about two weeks prior to this time, when it became so offensive to smell and foul to taste, that they had to abandon it. Just around the corner of the house, say ten or twelve feet from the well, stood an overflowing swill-barrel, from which there was easy communication. All the family recovered except one, a young lady eighteen years old, in whom a hemorrhagic complication was superadded.

OCEAN COUNTY.

EAGLESWOOD. - - - *Report from* WM. P. HAYWOOD.

Water-supply is nearly altogether from wells; a few families, and I notice the healthiest ones and the longest lived, have always used spring or brook-water. In the principal village of this township, viz., West Creek, the well-water is exceptionally bad, hard, and of offensive smell. As the graveyard now well filled with the dead, is near the centre of the village, and on a rise of ground, and all the wells with offensive odor and bad taste are east of the graveyard, and near by (my own is about twenty-five paces), I have long ceased to use my well-water for drinking purposes, believing it to be contaminated with the decomposition of the dead bodies. If time would correct the evil I should apply to the Legislature to have the graveyard closed hereafter to interments, but from what I have seen and know, fifty years hence would make no improvement; the mischief is irreparably done in the former ignorance of our fathers. I have noticed that all the families living east of the graveyard have more or less sickness, a great deal more so than those living west of it; as the streams all run east to the bay shore, this may account for it. I had one death in my own family, and several others sick with typhoid fever. This happened several years ago; since then, we have stopped using well-water, and have been free from any diseases traceable to bad water. I find that where brook-water is substituted for well-water, children suffering from cholera infantum, or any one with bowel affections, rapidly recover, *i. e.*, where other proper means are resorted to, but medicine is of no use when well-water is used.

Our natural drainage is good. Some meadow and swamp lands have been artificially drained. No sewage matter of any account is carried off by brooks or streams.

The common mode of emptying privy-vaults is by mixing coal ashes, or road-dust, or its equivalent, with the contents, and removing a short distance, and covering with earth or sod, or both, and left sometimes for three to six months before using on corn or crops whose eatable product is above the ground. Some few ignorant persons use at once, even on their root crops.

PASSAIC COUNTY.

PASSAIC. - - - - - *Report from* F. H. RICE, M. D.

Much need of sewers; no natural or artificial defects in drainage. Much less malarial fever this year compared with last. No State law as to drainage or any other laws been applied here. Cesspools generally used, and many of them in a bad condition. Slop-water from the kitchen discharged in cesspools usually, but sometimes in privies.

WAYNE. - - - - - - *Report from* R. M. TORBET.

There are no defects in the natural drainage, except that noted last year. The amount of malarial fever has been less than last year, until the late severe storm, when there seemed to be a new outbreak of it.

There were quite a number of cases of scarlet fever in the township last fall. The disease was of a mild type, none of the cases being fatal. Also, a good many cases of mumps among the children of the different schools, making a slim attendance for a time.

There have been no especial cases of sickness since July 1st, except some small-pox cases in one family.

I think it would be well for the State Board to have prepared a set of ordinances in blank, to be sent to the local Boards, as a guide to them in carrying out the provisions of the act of last winter.

PATERSON. - - - - *Report from* J. J. QUINN, M. D.

The report on vital statistics, and also that of the next year, will show the results of the small-pox epidemic, so far as deaths record it. It has had many incidents, caused much privation and great expense, but it demonstrated the need of a Board of Health under the State laws. The Board is formed too recently for a report.

MANCHESTER. - - *Report from* WM. D. BERDAN, *Paterson.*

A few driven wells are used; some are satisfactory, and some are not.

The filters used are made of tin, divided into apartments, and these apartments separated by perforated partitions, the holes being smaller after each passage of the water; with an opening in front, so that leaves or litter of any kind may be removed at pleasure.

There is defective drainage in a piece of property near the village of Haledon. The physicians state it is the cause of malarial and other fevers in that neighborhood.

Otherwise, in this section, the amount of malaria is not so great.

The piece of property having defective drainage is soon to be properly drained and filled up with sand.

SALEM COUNTY.

MANNINGTON. - - - - *Report from* D. F. GRIER.

The report alludes to a disease of animals, also transmissible to man, which came under the cognizance of this Board, and was pronounced to be anthrax or splenic fever, in the earliest cases. Prof. Satterthwaite, of New York City, and his assistants also pronounced the disease anthrax, although, amid the swarm of bacteria, they did not discover the bacillus anthracis. Here, examination was confined to the blood taken from the vessels of the neck. This report confirms the diagnosis, as it is stated that Prof. Leidy, of Philadelphia, found in the liver or spleen the bacillus which is characteristic of the disease.

SALEM CITY. - - *Report from* HON. CHAS. S. LAWSON.

The Mayor reports the organization of a Board of Health. The arrangements of water-supply are completed.

UPPER PITTSGROVE. - - *Report from* C. H. NEWKIRK.

There has been an increase of malarial fever.

SOMERSET COUNTY.

BEDMINSTER. - - - *Report from* WM. P. SUTPHEN.

Instances have come to hand where it was necessary for our Board to recommend certain work to be performed, by which it is believed causes of sickness were removed. In every instance these instructions have been complied with. There is malaria in our township, not confined to any particular locality, and in instances cannot be charged to any known cause. Our observations are, that by writing on the door-posts of every house in the township "*Be Clean*," there would be less malaria and all other sickness.

BRIDGEWATER. - *Report from* A. P. HUNT, M. D., *Somerville.*

Citizens of our township depend upon wells, either dug or driven, principally the former, for water supply, save in Somerville and Raritan, in which a few are supplied by the Somerville and Raritan water works, from the Raritan river. We believe there are no objections to it, by those who use it.

The *Ancient* arrangement of water-closet construction still prevails, viz.: A pit is dug, probably walled, and the closet set thereon, and in very many instances, a well from which the family or families obtain their water-supply is in close proximity.

Serious and grievous complaints are made by farmers owning lands along the shores of the Raritan river, by reason of the refuse matter turned from the dye-house of the woollen mills at Raritan, into the river, thus impregnating its waters with the chemicals and refuse material therein contained. A few isolated cases of enteric fever are believed to have been traced to local causes.

HILLSBOROUGH. *Report from* W. H. MERRILL, M. D., *South Branch.*

It is believed that, if a cistern is large enough and especially deep enough, and well kept, that it affords very good water. Of course, it is desirable that the roof from which it is collected should be slate. Quite a number of driven wells are in use. Further time must elapse before we can tell how satisfactory they are.

As to malarial fever, there have been fewer cases, but the tendency to head symptoms has been marked, and severe congestion of the brain has been associated often enough to be noticeable.

During the spring, pink-eye was prevalent, but few deaths resulted. Chicken cholera has been less prevalent than in recent years. Those who have been troubled with it, do not try to raise many fowls, or sell the chickens early in the season.

No nuisance from trades of factories. However, it may here be noted that the attention of the Board has been called to a nuisance at Van Aken's station, caused by drainage from a silo used for storing beer-grains for cattle.

SUSSEX COUNTY.

BYRAM. - - - *Report from* C. F. COCHRAN, M. D.

The Health Board investigated the cause of three cases of typhoid fever at a farm-house, and traced the poison to a covered drain leading from the house; the remedy was applied, and no further trouble has been reported. A complaint was made by Mr. John Rose, that stagnant water was allowed to stand near his house, the water coming from the streets of Stanhope as well as from the houses on said streets. An investigation was made and a remedy sought.

GREEN. - - - *Report from* S. VAN SYCKLE, *Andover.*

In this township, there are three mills run by water, namely, Hunt's mills, Tranquility, and Huntsville. Tranquility and Huntsville have, in the past years, been very unhealthy on account of the lowness of the water, which uncovers the mud and leaves it bare to the air. But for this year, they have been much more healthy.

STILLWATER. - - - - *Report from* C. V. MOORE.

The report shows that there are in the township too many cases of periodic fevers, and that the drainage of parts needs to be carefully considered.

UNION COUNTY.

PLAINFIELD. - - *Report from* H. H. LOURIE, M. D.

The epidemic of measles, last spring, in Plainfield, was unusually severe, and several deaths occured. An oilcloth factory has been complained of because of its odors. Driven wells are sometimes found impure and deepened. The city has no sewers.

SUMMIT. - - - - - *Report from* D. M. SMYTHE.

The Board have given especial attention to privy-vaults and cesspools, and have pleasure in reporting that the ordinances of the Board in relation thereto, are being complied with, and the danger heretofore existing from overflow drains is rapidly diminishing. Cesspools and privy-vaults are emptied by means of the "odorless excavating pro-

cess," and the refuse and excreta, after being made innocuous, are composted for fertilizing purposes.

A charitable institution—half orphan asylum—under the auspices of the Episcopalian denomination, has been opened since last report. The health of its inmates is provided for by careful sanitary arrangements.

The Board, chiefly through persuasive influence, have been instrumental in abating several nuisances, and placing many locations upon proper sanitary bases; every pond in the thickly-settled portion of the township has been *drained and filled*. The Board have in contemplation other important sanitary improvements.

No prevalent diseases during the last year.

The people at their last annual town meeting, voted an appropriation of *five hundred dollars* for health purposes, by means of which the Board have been enabled to correct certain conditions which would have ultimately become destructive to health interests.

The poulation of the township is two thousand and sixty-nine.

WARREN COUNTY.

BELVIDERE. - - - - *Report from* ISRAEL HARRIS.

There were several deaths from scarlet fever, and measles largely prevailed. Public funerals in case of deaths from scarlet fever were not had.

PHILLIPSBURG. - - - *Report from* S. W. DEWITT.

A special nuisance is a stagnant drain with not sufficient fall to carry off the bad water which collects therein. The council have promised to abate the same, but have not yet made a beginning.

No special disease of animals, except, early in the summer, the horses belonging to the street railway company were prostrated with a throat and head disease, and were not used for some weeks. They called it distemper.

No particular improvements, except that the Board has strictly enforced its ordinances in all respects, and the result is a better sanitary condition.

We know of no cause of disease prevalent. We have been surrounded with small-pox in neighboring towns and villages, but have had no cases here.

The malaria, which a year ago was prevalent during the dry season, has not made its appearance this season. We have heard of but few cases of the chills, while a year ago the town was full of it. We reorganized our Board of Health under the act of 1882, and adopted a code to govern us, but thus far have had no occasion to enforce at law any of its sections.

I think the Boards of Health of towns as well as of cities, should control the sale of milk, instead of having to call upon the State inspector; as it is under the present law, local Boards have no power to stop the sale of bad milk, but must call upon him.

OXFORD, - - *Report from* L. B. HOAGLAND, M. D.

During the fall and early winter of 1881, scarlet fever was quite prevalent in our township, and as our Board of Health was not then organized, nothing was done to prevent its spread, except what was done by the physicians, individually. There were, in all, about sixty cases and ten deaths; the majority of the deaths being from convulsions, during the first and second days of the disease. Would also note that there was an unusually large number of cases of dropsy followed it. Also a wide-spread epidemic of measles; no deaths.

About the middle of March, 1882, there occurred in the town of Oxford a case of discrete small-pox, supposed to have been contracted by a man loaning a stranger a shirt to sleep in one night, and then wearing the same himself, without its having been washed. With this as a centre, it spread until we had, in all, thirty-five cases. The Board of Health was organized at once, and adopted a stringent code of ordinances, relating to the spread of contagious diseases, which were posted throughout the township.

Meetings of the Board were held weekly, and all houses where small-pox was known to exist, were quarantined, and patrolmen hired to enforce the code of ordinances and supply the inmates of the infected houses with the necessaries of life.

Of the 35 cases, 16 were confluent, 7 discrete, 12 varioloid. There were seven deaths in all.

No person previously vaccinated was attacked with confluent small-pox, and no deaths occurred where persons had been vaccinated. About fifteen hundred persons were vaccinated during its prevalence, one-third of them with humanized virus, and the remainder with non-humanized bovine virus, the constitutional effect being much the

more marked when the latter was used. One child, of 5 years, lost its life by taking cold in her arm; gangrene set in, and she died from septicæmia. Some of the sores were three or four months in healing.

At present, October 25th, 1882, there is considerable malarial fever in our township, and almost all the cases show a disposition towards a low typhoid type. Have had a few cases of undoubted typhoid fever, due, I think, to personal filth and improper ventilation of houses, together with bad drainage of the soil. The attention of the Board will be called to the existing conditions, and some action taken at once.

WASHINGTON, - *Report from* WM. M. HARTPENCE, M. D.

Public health laws are attended to only, as yet, upon complaint of the existence of a nuisance, or infectious or contagious disease, &c. The Health Board has no regularly appointed time for meeting, with the exception of what the State requires. The sanitary matters of this township are placed in the care of an acting health physician, who is Secretary of the Board and is authorized by the Board to act promptly in abating and removing all nuisances, &c., &c. The township is not provided with a pest-house or hospital. The registration of vital statistics is kept as the State law directs for all townships. For sanitary expenses and for the indigent poor, we will have to appropriate not less than one thousand dollars, due to an outbreak of small-pox, a report of which is herewith appended. The heating of houses is mostly by stoves, coal and wood being the fuel used.

About the 1st of April, 1882, information reached us, through private sources, that small-pox had broken out at Oxford, a small town lying north of us, where mining and the manufacturing of nails are carried on quite extensively. The southern limits of this town lie within this township. On May 3d, we received notice from the local Board of Health of Oxford township that the disease had spread to one family within our limits. A meeting of the Health Board was immediately called and the whole matter placed in the care of the acting physician. The infected family was immediately visited, and it was found that a small child had confluent small-pox. The family, consisting of nine members, together with the premises, were forthwith placed in quarantine, notice of "small-pox" was posted upon the house, and the whole put in charge of an officer. On the evening preceding the notice given the Board of Health, one of the daughters of the family was married, and several guests from Washington and Oxford

were present on that festive (?) occasion, while, at the same time, the child was lying up stairs (the house consisted of two rooms only) with this most loathsome disease, unvaccinated. There were five others also unvaccinated in the family. These were immediately ordered to be vaccinated, but the parents positively refused, giving as an excuse their belief that the conjoint effects of vaccination and small-pox would certainly kill the children, and no amount of persuasion and argument would convince them to the contrary, and, as the law did not *compel* them to be, the result was that three out of the five soon sickened and died with the most violent form of the disease. The parents, who had been vaccinated years ago in Ireland, had varioloid, but in a light form. The developments of the wedding were looked to with a deal of interest, you may judge, but, thanks to the immortal Jenner, vaccination, that efficient prophylactic, saved the whole county hereabouts. Out of the whole number of guests there were only three or four contracted the disease. One young woman near by, and within this township, took varioloid and gave it to her mother, rather an elderly woman, but vaccination saved them.

Another family, also living near by, consisting of six members, parents and four children at home, neither child vaccinated, took the disease. The first case, one of the children, resulted in death. Seeing the bad results from family number one, they consented to immediate vaccination when the first child was declared to have the disease. Fortunately, the vaccinations were all successful, and the result was that neither of the three remaining were ill enough to be kept in bed one day. If these are not cases in point positive of the efficacy of vaccination in mitigating or entirely aborting small-pox, then our judgments are certainly very deficient. As a result of the presence of this epidemic, a general stampede for vaccination was made popular, and vaccinations were resorted to by old and young, and it would be difficult to find one to-day unvaccinated or upon whom several attempts were not made.

Bovine virus was generally used, and our observations lead us to conclude that the constitutional effects were greater in a larger number of cases than we had observed in years past when using humanized virus; and, also, our experience makes us believe that the resulting sores were longer in healing (speaking in general) than with the humanized virus.

Scarlet fever appeared in the township during the spring months, but did not assume a marked epidemic character and was of a medium

type. There seemed to be an unusual tendency, especially in the milder cases, to albuminous nephritis afterward. Malarial or periodical troubles, as usual, prevail, but not to the same extent as heretofore.

Most of the other reports contain matters of local interest and information, which, together with the returns of vital statistics, enable us to judge of the health of the respective localities. It is especially apparent how many of the Boards of townships are increasing in efficiency and in their comprehension of the fact that undrained land and small villages, and often individual households, have local causes of disease. Much more watchfulness is used than formerly, and the people are becoming more intelligent as to needs, if not always as to methods. Now, it often occurs that in the local Board are one or more persons who carefully read the reports or other sources of knowledge, and thus become of great advantage by their advice in preventing, as well as managing, nuisances or other conditions unfavorable to public health.

REPORT UPON HEALTH FOODS, INVALID FOODS AND INFANT FOODS.

BY PROF. ALBERT R. LEEDS, PH. D., MEMBER OF COUNCIL OF ANALYSTS OF NEW JERSEY.

The importance of extended inquiry into the various subjects comprised within the scope of the present article may be best gathered from the following considerations:

1st. The preparation of these various kinds of foods has become a great and growing department of manufacturing industry. The amount of capital invested is very large, the competition keen, the temptation to put upon the market inferior and adulterated articles pressing, and the opportunities for deceitful advertising almost unlimited. 2d. The relative value, as food-substances, of these various preparations cannot be determined by a merely superficial examination, nor, in most cases, is the microscope alone sufficient, and this has led to the recent attempt, on the part of some manufacturers, to destroy the reputation of many articles of prepared foods, and to ruin the business prospects of their competitors in trade, by false and malicious publications. 3d. The necessity of health and invalid foods for thousands who are suffering from functional disturbances of the digestive organs, from diabetes, etc., is fully recognized by the medical profession, and the corresponding importance of encouraging the manufacture and sale of excellent, and of preventing that of inferior and adulterated articles. 4th. The frightful mortality among infants is due more largely to diseases of the organs of digestion than to any other single cause, and for this reason it may properly be said that no subject can claim for itself a more anxious and careful study than that of infants' foods. And when we discover, as we shall later on, that in some instances manufacturers are selling largely for infants' food

preparations entirely destitute of those elements upon which the nutrition of the body depends, and which could not be persistently used without permanent injury or resulting death, the criminality of such traffic can be adequately appreciated.

METHODS OF INVESTIGATION.

Before giving in detail the analytical methods employed, I regard it necessary to discuss the relative value of the results which can be obtained by the use of the microscope alone, and those which can be obtained when, in addition to the microscope, all other aids to complete investigation of foods are made use of. This preliminary discussion is necessary because of the claim recently put forth by Dr. E. Cutter that the microscope alone is sufficient for the purpose, and as a result, he has been led to make many false statements, at present circulated broadcast throughout the community and calculated to inflict much injury upon manufacturers and consumers alike.

In the examination of the various kinds of food-substances, I relied upon three sources of information: 1st. Their appearance under the microscope. 2d. Their physical properties and their behavior when washed with water, etc. 3d. Chemical analysis. At the outset I hoped, that by means of the microscope alone, sufficient information could be obtained to enable me to form an approximately correct estimation of the relative amounts of starch, gluten, cellulose, etc., in the flour, and so to form an opinion as to its food value. I had been constantly employed in the use of the microscope for detecting the adulteration of food, and had found that it often gave sufficient information to make it possible to dispense with chemical examination. This was frequently true of the spices, in the adulteration of which the starches of various cereals, powdered crackers, etc., are largely employed. I anticipated a similarly satisfactory result in the examination of the cereal foods themselves, but in practice this anticipation was not sustained. The reason is, that to admit of identification under the microscope, the physical characters of the bodies observed must not be destroyed by any treatment to which they have been subjected. Now, in the preparation of cereal foods, by the processes of milling, and in some cases of washing, to which they are subjected, the appearance of certain constituents of the grain is so far altered as to make their certain recognition very difficult and their quantitative estimation impossible.

What I mean by this statement will be more clearly seen by com-

paring the actual results of a chemical analysis of flour with those obtained by the microscopic examination. By analysis we can readily and accurately determine the percentages of starch, gluten, cellulose, albumen, gum, sugar and fat. Of course, it is out of the question to determine more than the first three constituents, viz., the starch, gluten and cellulose, by microscopic examination. But can we do so much as this? Can we even form a tolerably accurate guess at their relative percentages? I have made a great many attempts to do so, and have entirely failed. And lest any microscopist charge this failure to a lack of faithful use of the microscope, let me suggest that he subject his results to the only rigid proof of their accuracy. Let him first make a quantitative estimation of the percentages of starch, gluten and cellulose by means of the microscope, and then determine the precise percentages by chemical analysis. And, in order that he may be entirely without bias in his judgments, let him conduct the inquiry in the order named: first with the microscope and then with the balance, because the eye has a marvelous proneness to see whatever the mind is previously persuaded actually exists, but the chemical balance errs not. And if this course is taken, and the results of the microscopic examinations are carefully noted down, as I have myself done in the case of more than thirty differently prepared wheat flours, and afterwards compared with the figures obtained by chemical analyses, no manner of agreement will be found between them. For example, I find in my notes that a sample of a certain wheat flour finely ground, exhibited under the microscope a "large amount of starch, some gluten, and a considerable amount of fibrous tissue." I did not attempt to translate these results into figures, from a feeling of utter inability so to do, but thought that the adjectives might be useful for future reference. Another sample of flour, claiming to contain the constituents of wheat flour in the the same proportion as the original wheat grain, is put down as remarkable for the large number of perfect unruptured gluten-cells which it contained, and which gave rise to the impression that the relative amount of starch in this sample was small. Subsequently, both these flours were analyzed, and the former was found to contain 60.95 per cent. of starch, and the latter 70.98 per cent. In other words, the flour which I judged, from its microscopic examination, to contain the lesser amount of starch, actually contained 10 per cent. more than the other. To take another illustration, I find among my notes allusions to two samples of flour, specially prepared to diminish the natural percentage of starch, and which apparently

had the same relative amounts of starch when viewed under the microscope. But the one contained 59.72 per cent. of starch, the other 64.67 per cent.

It may properly be objected to these results, that I am speaking of cases where there was only a difference of five to ten per cent., and that in the cereal foods which are under discussion, the differences are much greater, so great, indeed, as to make an approximate quantitative analysis by the microscope possible. But I do not think this objection will hold good. For, in the first place, the amount of percentage variation in the composition of flours prepared with especial reference to their containing the constituents of the entire wheat, and those prepared like ordinary flour, and those prepared with a view of artificially raising the percentage of albuminoids to a maximum, is not by any means so great as is generally supposed.

I spoke above of a flour claiming to represent the wheat grain in its entirety, and with none of its constituents changed from their natural proportions. It contained 70.98 per cent. of starch. Another specimen, likewise supposed to contain the unaltered constituents of the entire grain, contained but 62.46 per cent. of starch. There is no reason to suppose that these flours did not represent the entire grain, because I have analyses of the entire grain, containing these same percentages of starch. Still another contained 72.65 per cent. of starch, and the latter may be taken as a maximum, or, if not a maximum, not far below the maximum, and having the advantage of being a figure determined by myself upon a sample of American flour. So, too, the number of 62.46 may be taken as not far from the maximum in a flour representing the entire wheat. Here we have a variation of only ten per cent., and yet the properties as food-substances of those whole wheat flours would be quite different.

I find notes of my own analyses of ordinary wheat flour, with percentages of starch varying from 65.66 per cent. to 71.41 per cent. These figures, like all the preceding, refer to the undried substance; on the dried, they would be 75.11 and 81.82 per cent., respectively. I do not happen to have analyzed wheat flour presenting as great variations in composition as the specimens analyzed by Vauquelin (Ure's Dictionary, p. 48,) according to which analyses the flour made from the hard wheat of Odessa, contained (undried) 56.50 per cent. of starch and 14.55 per cent. of gluten, and the flour made from the soft wheat of Odessa, 72.00 per cent. of starch and 7.30 per cent. of gluten. These are astonishing variations, the difference between the minimum and maximum of starch being nearly 16 per cent.

Finally, with regard to the cereal foods artificially prepared, I have samples in which the percentage of starch is as low as 49.43 per cent. (undried.) The entire range of variations is, therefore, between 49.43 per cent. and 72.65 per cent.; the balance in each case being gluten, and other bodies not starch. The problem, in other words, is not to decide between cereal foods containing no gluten and those which do, but between cereal foods rich in gluten, and those poor in gluten. There are no cereal foods, or even the poorest ordinary wheat flours, which do not contain some gluten. On the other hand, there are no artificially prepared cereal food-substances which do not contain starch. I thought that possibly a non-starchy food-substance might be found in the "Farine de Gluten," and purchased a package containing five hundred grams, at the price of a dollar. The high price surprised me, and I thought it was probably due to the labor involved in eliminating the starch.

This gluten is almost tasteless, very finely ground, and under the microscope shows abundant starch-grains. I did not see any unbroken gluten-cells—although I am not prepared to say they do not exist, and may have escaped unruptured from the processes to which this French gluten is subjected. Chemical analysis gave for the starch 53.38 per cent. (reckoned on the undried, 60.04 per cent. computed to the dried sample.) This result made me well nigh certain that the percentage of gluten in this so-called "Farine de Gluten" must fall considerably below one-half, and subsequent experiments show that I was not mistaken.

On looking over my own results, obtained by the use of the microscope and chemical analysis, and comparing them with recent publications on this subject, I find that I am in substantial agreement with Dr. George B. Fowler, judging from the results of his observations, detailed in his article upon "Farinaceous Infant Food" (Am. Jour. of Obstetrics, XV., p. 449,) and in agreement, also, with Prof. Jos. G. Richardson, M. D., as his views are given in an article entitled "A Serious Microscopic Blunder" (Philadelphia *Med. News*, June 1882.) On the other hand, my own results are entirely at variance with the statements contained in a paper on "Cereal Foods under the Microscope," published in the *Amer. Med. Weekly*, Jan., 1882, by E. Cutter, M. D.

In the last article, it is stated that wheat and other grains consist almost exclusively (which is untrue) of gluten and starch, and that the estimation of the relative amounts of these two ingredients can be

effected with certainty by the use of the microscope alone. The falsity of this assumption is most strikingly shown by the erroneous conclusions to which it has conducted its author. It has led him to make statements altogether at variance with those of the recognized authorities on the subject of cereal foods, and in contradiction to those supported by chemical analyses of the foods under question.

I do not wish better evidence of the unscientific nature of Dr. Cutter's methods of microscopic examination than his own statements. He acknowledges himself that in the mechanical processes to which the grains of wheat are subjected, the gluten-cells are ruptured, but proceeds throughout the article on the assumption that the richness of a flour in gluten can with certainty be detected under the microscope by the relative number of gluten-cells. This assumption leads him in the outset to state that "in making flour, three-fourths of the gluten is removed, and the chief strength of the flour is thus destroyed." If the gluten is removed, then chemical analysis ought to fail to find it. But chemical analysis tells an entirely different story. I find, according to Vauquelin, that the minimum amount of gluten in the wheat flour analyzed by him, was 7.30 per cent., and the maximum amount 14.55 per cent. The amounts of starch in these two extremes were 72 and 56.50 per cents., respectively, the starch varying approximately inversely with the gluten. I say approximately, because other constituents vary also, and the correspondence is only approximately correct. Thus, according to Vauquelin, one sample of flour from the soft wheat of Odessa contained 12 per cent. gluten and 62 per cent. of starch. Another sample from the same Odessa wheat contained 12.10 per cent. gluten and 70.84 per cent. starch, or more than 7 per cent. greater of starch. But the former has as much as 7.56 per cent. sugar, the latter only 4.90 per cent. The average percentage of gluten in the eight samples of flour analyzed by Vauquelin (loc. cit.) was 10.93 per cent., of starch 68.08 per cent. (computed on the undried samples.) According to Prof. R. C. Kedzie (Rep. Mich. Bd. Agr. 1877, p. 350,) the average of sixteen analyses of Michigan winter wheat flour gave 10.54 per cent. albuminoids (principally gluten), with a maximum of 12.25 and a minimum of 8.94 per cent. According to the same authority, the average of five samples of Kansas spring wheat flour showed 12.58 per cent. albuminoids, with a maximum of 13.56 and a minimum of 11.37 per cent. Let us now see how these figures compare with the amounts of gluten and starch in the grain before grinding. I shall use the term albuminoids rather than gluten in making

these comparisons, because "albuminoids" include all the nitrogenous portion of the grain, while "gluten" should properly be restricted to that portion of the albuminoids which is insoluble in water. Inasmuch, however, as gluten forms by far the largest part of the albuminoids, it is frequently used as including, in opposition to "starch," the nitrogenous part of the grain.

Now, the average amount of albuminoids in forty-nine samples of American winter wheat (Rep. Conn. Agr. Ex. Station, 1880,) was 11.71 per cent., with a maximum of 14.47 and a minimum of 8.40 per cent. The average of six analyses of the spring wheat was 12.67 per cent. of albuminoids, with a maximum of 15.4 and a minimum of 8.14 per cent. According to König (*Die Menschlichen Nahrungs und Genussmittel*, 11,273,) the average composition of two hundred and fifty samples of European wheats was 12.42 per cent. albuminoids and 64.07 per cent. starch. Is there any support given by these figures to the statement that three-fourths of the gluten is removed from wheat in its conversion from grain into flour? The popular notion that there is an almost entire removal of gluten in the process of milling, is a wide-spread fallacy. The assertion by Dr. Cutter that three-fourth of the gluten had been removed in making the flour examined, really means that his microscopic examination was utterly inadequate to find it. Almost all the gluten originally present in the grain was in the flour, but by the microscope he could find only twenty-five per cent. of it.

Whilst I relied principally upon chemical analyses in conducting these inquiries, and assigned to microscopic and physical examination a secondary place, yet the results thus attained are in close accord with those arrived at by Dr. Fowler, who relied chiefly upon the microscope, and those of Dr. Richardson, who depended upon physical separations merely. The conclusions arrived at by the former are thus summed up: "*Simple microscopic inspection, unaided by chemical means and physical processes, is wholly unreliable and inadequate in determining the composition and nutritive worth of farinaceous substances.* * * * I am prompted to thus repeat and insist upon these points, because I see that so reliable an authority as Dr. Jacobi* has accepted and enthusiastically endorsed the conclusions aimed at by Dr. Ephraim Cutter, * * * who relies altogether upon the absence or presence of gluten-cells in estimating the nutritive value of farinaceous preparations. I must, with all respect, protest against Dr.

* Infant Feeding and Infant Foods, *Med. News*, Feb., 1882.

Cutter's method, his conclusions and his physiological arguments, as well as the remarks of his editor, Dr. Gailleard."

Equally strong language is used by Dr. Richardson. He says: "Dr. Cutter asserts that the opaque, oval or rounded cells (constituting the fourth coat of the wheat grain, according to Prof. Parkes,) afford most of the gluten, and hence on their presence the chief strength of the food depends." He therefore declares that a large number (fourteen) of the food-stuffs he examined, and found under his microscope to display none of these so-called "gluten-cells," "contain no gluten," (page 9), and broadly intimates that they are consequently frauds upon the public. But the fact is, these so-called "gluten-cells" (denominated by Payen, *oleiferes*,) probably include in their substance starch, phosphates, fatty matters and coloring materials, containing only part, perhaps, but a small part, less than one-seventh, of the gluten which exists in wheat. Thus, Peligot, as a mean of fourteen analyses, gives the percentage of gluten in flour (whence "gluten-cells" are removed) at 12.8, while in bran (containing nearly all the "gluten-cells") it is only 10.84, and other observers confirm his statements. If my friend, Dr. Cutter, or any of his disciples, would like to satisfy himself that he has made a lamentable mistake in this matter, let him take say ten grams of one of the fine flours he asserts "contain no gluten," mix it with water into a dough, let it stand for half an hour and then stir it in a porcelain capsule, with successive portions of water, until the starch is washed away, and the adhesive fibrillated gluten is left nearly pure, in the proportion, after drying, of from seven to twelve per cent. (*Vide* Parkes' Practical Hygiene, fifth edition, 1878, p. 224.) The small starch-corpuscles and granules, left by this process entangled among the threads of gluten, can be beautifully differentiated by adding a drop of iodine solution, which affords the usual deep-blue reaction with the starch, but dyes the gluten filaments of a yellowish-brown tint.

Inasmuch as I have not been able to analyze all the great variety of health, invalid and infant foods in the market, I shall discuss only those to which my attention has been directed, and shall classify these, for the sake of convenience, in the following manner. The amounts of ash and saline constituents were not determined:

A. *Wheat.* Not previously cooked or baked, including: 1. Diabetic Light, and 2. Dark Gluten. 3. Gluten Flour. 4. Fibrine de Gluten Conor. 5. Fine Granulated Wheat. 6. Franklin Flour. 7. Arlington Wheat Meal. 8. Arlington Mills Graham.

B. *Wheat.* Previously prepared by cooking or baking. 9. Hazard's Graham Farina. 10. Blair's Prepared Wheat Food. 11. Hubbell's Prepared Wheat Food.

C. *Barley.* 12. Imperial Granum. 13. Ridge's Food.

D. *Oat Meal.* 14. Baby Sup, No. 1. 15. Baby Sup, No. 2.

E. *Mixtures of Various Cereals.* 16. "A. B. C." Cereal Cream. 17. "A. B. C." Cereal Milk. 18. Robinson's Patent Barley. 19. Farwell & Rhine's Gluten Flour. 20. Savory & Moore's Best Food for Infants.

F. *Milk Foods.* 21. Nestlé's. 22. (*a*) Anglo-Swiss. 22. (*b*) American-Swiss. 23. Gerber's.

G. *Liebig Infant Foods.* 24. Mellin's. 25. Hawley's. 26. Horlick's.

Non-farinaceous. 27. Keasbey's and Mattison's.

A. *Wheat, not previously cooked or baked.* My attention was more particularly drawn to this class of health foods by the request of my colleague, Prof. Robt. H. Thurston, who had been using the preparations of the N. Y. Health Food Co. for years in his family, and who was startled in common with many others who had been habitually using them, by the statements above alluded to of Dr. Cutter that these foods contained no gluten. Nos. 1, 2, 3, 5 are preparations of the New York Health Food Co. No. 4 is the French gluten so much prescribed by physicians to diabetic patients. Nos. 6, 7 and 8 are flours and meals recommended by Dr. Cutter, on the strength of his microscopic examinations, as of superlative richness in gluten. No. 6, the Franklin flour, being pronounced by him the best flour examined, and a reliable infants' food.

	Moisture.	Sugar.	Starch.	Albuminoids.
1. Diabetic light gluten	11.90	3.67	49.53	28.18
2. Diabetic dark gluten	11.89	4.09	49.43	28.18
3. Gluten flour	9.23	2.12	43.17	28.24
4. Fibrin de gluten Conor	11.10	5.32	58.38	21.98
5. Fine granulated wheat	10.75	4.77	60.95	13.62
6. Franklin mills flour	11.00	3.72	65.23	8.55
7. Arlington wheat meal	11.99	......	....	7.79
8. Arlington mills graham	13.23	......	....	7.09

It is important to invalids to note that the American gluten has less sugar and starch and more albuminoids than the very expensive French preparations. The Franklin flour contained not only little gluten, but so much bran that, when used for infants' food, it was soon abandoned on account of resultant diarrhœa.

B. *Wheat, previously prepared by cooking or baking.*

	Hazard's Graham Farina.	Blair's Wheat Food.	Hubbell's Wheat Food.
Moisture	9.12	9.85	7.78
Fat	0.81	1.56	0.41
Grape sugar	2.19	1.75	7.56
Cane sugar	2.49	1.71	4.87
Starch	69.68	64.80	67.60
Soluble carbohydrates	6.35	13.69	14.29
Albuminoids	8.48	7.16	10.13
Gum, cellulose, etc	5.56	2.94	undet.

9. *Hazard's Graham Farina.* It is claimed that this preparation is made out of the choicest Genessee white wheat; that it is baked twice, so as to be ready for immediate use without further cooking, and that by the processes employed the starchy and fat-generating substances are removed, whilst all the phosphates, etc., and nutritive qualities are retained.

This farina has a dry, rather flat taste, like ground crackers. When cooked according to the directions, it has a brownish-yellow color, with the smell and taste of crackers. It is palatable, but not so much so as either of the other two preparations included in this subclass. The percentage of gum, cellulose, etc., is very large. The amount of starch is greater than in either of the other two, whilst the soluble carbohydrates are much less. These differences account for the less palatability of this preparation.

10. *Blair's Wheat Food.* It is claimed that this is prepared from choice wheat in such a manner as to retain all the nutritive constituents and reject those which are irritating or otherwise objectionable. Moreover, that by thorough cooking, such physical and chemical changes have been brought about as to facilitate mastication and the subsequent action of the fluids of the stomach, thereby rendering the food more easily digested. It is stated to be especially beneficial in intestinal-like dysentery, cholera infantum, etc.

Uncooked, this flour has a sweet, pleasant taste. When cooked according to directions, it forms a very smooth paste with a faint tinge of color, resembling arrowroot in its flavor and quite palatable without the addition of salt, sugar, milk or other accompaniment.

11. *Hubbell's Wheat Flour.* Claimed to be made from wheat alone, floured, and carefully baked from eight to ten hours, at about the temperature of boiling water. "It includes all the flesh-forming constituents, earthy and saline elements of the grain, with only a portion

of the starch and none of the silicated coating. It keeps without change."

This flour is quite sweet and palatable even in its uncooked form, and when moistened with the saliva is more pasty than the Blair's Wheat Flour. When cooked it forms a perfectly white, smooth paste with a very delicate flavor. It is more starch-like in consistency than Blair's, a difference due in part to the larger percentage of starch, and less pronounced in flavor, this being probably due in some degree to the smaller percentage of fat. In both Blair's and Hubbell's the percentage of gum, cellulose, etc., is extremely small, in the latter case so small that it was not determined. In nitrogen Hubbell's is much richer than either of the other two preparations, and its value for purposes of nutrition correspondingly greater. The reaction of the Graham Farina, of Blair's Food, and of Hubbell's, is in each case neutral.

The excess in the amount of saccharine matter in Hubbell's Food above that contained in ordinary wheat flour induced me to write for the particulars of the process used, and to institute an analysis of the original flour from which the food was prepared, in order to discover the nature and the extent of the change it had undergone. The process, I was informed, is as follows: A large baker's oven is heated to about 340° to 360° F. The flour, contained in shallow Russia-iron pans, is then put in, the fire having meantime been withdrawn, the oven closed, and the flour left there about twenty-four hours. When the oven is re-opened the temperature will have fallen to 100°, and after sieving, the prepared flour will be ready for use. The flour used is the best grade as made by the roller process, the second grade containing more starch, less gluten, being that bought and used by bakers.

The change in composition produced by this process will be seen by an examination of the same flour before and after baking.

	Wheat Flour.	Same Baked.
Moisture	9.02	7.78
Fat	1.01	0.41
Grape sugar	2.34	7.56
Cane or inverts sugar	2 46	4.87
Starch	76.07	67.60
Soluble carbohydrates	5.66	14.29
Albuminoids	6.40	10.13

It will be seen that the flour has lost moisture in baking and also a portion of its fat. These changes, however, are of little moment com-

pared with the considerable decrease of starch and its conversion into saccharine bodies. The soluble carbohydrates are considerably more than doubled, and this change is one of the greatest value and importance, so far as the dietetic value of the prepared food is concerned. The considerable increase in the percentage of albuminoids I am unable to account for.

C. *Barley.*

	Imperial Granum.	Ridge's Food.
Moisture	5.49	9.23
Fat	1.01	0.63
Grape sugar	trace.	2.40
Cane sugar	trace.	2.20
Starch	78.93	77.96
Soluble carbohydrates	3.56	5.19
Albuminoids	10 51	9.24
Cellulose, gum, etc	0.50	......

12. *Imperial Granum.* It is stated to be "in composition principally the gluten derived by chemical process from very superior growths of wheat—a solid extract." Dr. Fowler states as the result of his microscopical examination, that if the material from which this preparation is derived contains any gluten at all, the "chemical process" resorted to in order to extract it, has at the same time either destroyed it or so altered its character as to render it no longer recognizable by the usual tests. This is an excellent illustration of the difficulty which is encountered in deciding with the microscope upon the constitution of a cereal after treatment, for whilst Dr. Fowler's statement of the microscopic appearance is correct, yet as a matter of fact the Imperial Granum contains 10.51 per centum of albuminoids. On the other hand this is not sufficient by any means to bear out the statement that the Imperial Granum consists principally of gluten. According to Dr. Fowler it is simply coarse barley flour.

13. *Ridge's Food.* It is advertised as prepared from carefully selected winter wheat, reduced to an almost uniform fineness. The product is then thoroughly cooked by a steam-baking process, which gradually changes a large proportion of the starch into dextrine, excluding only the woody fibre. It is afterward rendered a little sweet and slightly alkaline.

Dr. Fowler states that the Ridge's Food is apparently barley flour finely ground, and that the odor, dough and microscopic appearance indicate no other ingredients. I have accordingly so placed it,

although both in this case and in that of the Imperial Granum my own observations would have included them among the wheat preparations. Both of these foods when cooked are very palatable. Both have a neutral reaction. Both have a considerable percentage of albuminoids, that of Imperial Granum, in the two samples analyzed, being the higher, and both have a very high percentage of starch.

It should be very carefully borne in mind that wheat flour after careful baking is extensively altered, and that the albuminous bodies become considerably more soluble in water. A wheat flour which in its original condition would yield a very considerable amount of crude gluten, on washing, after baking, will leave a much smaller amount of gluten, and for this reason the percentage of crude gluten in baked flours cannot be roughly estimated by washing and drying. For the same reason a baked wheat flour may be mistaken for barley flour, which gives a non-glutinous dough.

D. *Oatmeal.*

	Baby Sup, No. 1	Baby Sup, No. 2.
Moisture	5.54	11.48
Fat	1.28	0.62
Grape sugar	2.20	2.44
Cane or invert sugar	11.70	2.48
Starch	61.99	51.95
Soluble carbohydrates	14.35	22.79
Albuminoids	9.75	....
Cellulose, gum, etc	7.09	....

No. 1 is advertised as an excellent substitute for mother's milk, in case of infants under four months of age. It is a very sweet, partly crushed whole oatmeal, very palatable even before cooking and dissolving readily in the juices of the mouth. It is prepared from malted oats, and after the conversion of the starch has gone as far as it is thought it will proceed, the oats are carefully hulled, only a residue of the coat being left in the crack of the grain. The analysis shows the lowered percentage of starch and the increase of saccharine bodies due to this treatment.

Baby Sup, No. 2, consists of wheat flour, malted barley and potassium bicarbonate in the proportions given in Liebig's formula. In its dry state the mixture has but little taste, but becomes thin, sweet and palatable on cooking. The analysis gives but a partial result of this change, because the food was cooked only five minutes before the analysis, whilst the directions call for a half hour's cooking. But

already much of the starch had been converted into dextrin. These foods are most commendable efforts to carry Liebig's views into practice, and it is to be regretted that a certain amount of care and time is requisite to properly cook them, and for this reason they will probably have only a restricted use.

E. *Mixtures of various cereals.*

	"A. B. C." Cereal Milk.	Robinson's Patent Barley.	F. & R. Gluten Flour.	S. & M.'s Best Food.
Moisture	9.33	10.10	....	8.34
Fat	1.01	0.97	....	0.40
Grape sugar	4.60	3.08	....	20.41
Cane sugar	15.40	0.90	....	9.06
Starch	58.42	77.76	....	36.36
Soluble carbohydrates	20.00	4.11	....	44.83
Albuminoids	11.08	5.13	....	9.63
Cellulose, gum, etc	......	1.93	....	......

16. "*A. B. C.*" *Cereal Cream.* Stated to be "prepared from the most nutritious and digestible parts of the choicest wheat and barley, with all impurities removed." It appears to be a coarse meal of wheat and barley, but I did not analyze it, the box which I purchased being musty, mouldy and dark colored at the time it was opened. It presently became a living mass of maggots and was thrown away.

17. "*A. B. C.*" *Cereal Milk.* "Prepared by a scientific admixture of the nitrates and phosphates of wheat with the whole of barley; and, after adding the required sugar, we have secured an analysis almost identical with human milk. The wheat is first cleansed, then hulled, coarsely ground and the surplus starch removed, leaving the nitrates and phosphates. The barley is hulled, crushed and mixed with a proper proportion of the wheat nitrates and phosphates. The mixture is cooked by steam, dessicated, ground into fine flour, specks bolted out and the requisite amount of sugar added."

The statement that this food corresponds nearly with human milk in its nutritive ingredients is untrue, as will be seen by comparison with the following analyses of human milk, the first giving the average composition with the natural percentage of water, the second the same composition reduced to agree with the percentage of water present in "A. B. C" Cereal Milk.

	Woman's Milk.	Same Reduced.	Cereal Milk.
Water	89.00	9.00	9.33
Fat	3.00	24.82	1.01
Sugar	5.00	41.36	20.00
Starch	none.	none.	58.42
Albuminoids	2.65	21.93	11.08
Salts	0.35	2.89	undet.

Instead of one-fifth its weight in fat, it has but one-twentieth this amount or one-hundredth. Instead of that peculiar modification of sugar especially adapted to infants' needs, milk sugar, it has a mixture of grape and cane sugar, and these in a very different proportion. Whilst milk has no starch, this consists of more than one-half starch. And apart from the fact that the albuminoids of the cereal milk are entirely different in character from the readily assimilable albuminoids which are present in human milk, their percentage is but half so great. In fact, this cereal milk does not contain so large a proportion of albuminoids as average winter wheat. It appears to contain a larger percentage of barley than of wheat, but there is nothing to show that there is a corresponding dietetic advantage. The mode of preparation is very objectionable, in so far as after steam-cooking it must be thoroughly dessicated in order to render it fit for handling in commerce. If it is not thoroughly cooked and dessicated, the animal life may not be destroyed and it may mould and putrefy as in the sample of cereal cream examined. If it is thoroughly dessicated after steam-cooking, as it would be by long-continued heating in dry air at 150°, it loses a large portion of the flavor and odor on which the palatability of the cereals depends, and its digestibility is so far diminished as to render it liable to pass through the intestines without digestion. If the cereal milk could be, as its name implies, a cereal brought by cooking into a state fit for immediate use, it would not be open to this objection, but the indigestibility connected with the subsequent dessication is a matter deserving of serious attention.

18. *Robinson's Patent Barley.* Patent barley, technically, is ground pearl barley. Yet this preparation, while possessing most of the characters of what it purposes to be, is somewhat unlike pure barley flour. Its dough is more adhesive, and the white color, together with the mild barley odor, suggests the admixture of wheat flour. No gluten-cells are seen, but there are numerous granules unaffected by iodine and turned red by carmine (albuminous matter.) The microscopic examination shows starch granules free and in bundles, held

together by the cellulose. The larger corpuscles are probably those of wheat. I have adopted this description of Dr. Fowler, although I am inclined, from my own observations, to regard the preparation as merely barley flour.

19. *Farwell & Rhine's Gluten Flour.* "A gluten flour, substantially free from starch. For dyspeptics, diabetics and invalids." This flour has evidently been prepared with much care, and the result is a very low percentage of cellulose, gum, etc. The amount of starch has not been diminished nor that of albuminoids increased to the extent aimed at by the manufacturers, though the results are all in a favorable direction. There is no matter about which manufacturers are more apt to form exalted hopes than concerning their laborious endeavors to increase the relative percentage of gluten in flour. And the discrepancy between the claims put forth and the results actually obtained, I am persuaded, is not due, as some would have us believe, to a general lack of honesty on the part of the manufacturers, but to the difficulties in effecting an elimination of the starch by the processes employed.

20. *Savory & Moore's Best Food for Infants.* Claimed to be the only food specially prepared for the use of infants, and to be far superior to the ordinary kinds of Liebig's food in promoting the healthful growth of children. These are false claims, and the use of Liebig's name in connection with this food appears to be unwarranted. It bears no resemblance to Liebig's food in its composition, containing, as it does, over 36 per cent. of starch. I have placed it with the foods prepared from a mixture of cereals, containing, as it does, both wheat and barley. When viewed as a prepared meal, it is worthy of commendation, inasmuch as the percentage of soluble carbohydrates representing the dextrine, cane and grape sugar is high, the percentage of starch about half that present in ordinary wheat flour and the percentage of albuminoids not far below that of ordinary wheat flour.

F. *Milk Foods.*

	Nestle's.	Anglo-Swiss.	Gerber's.	American-Swiss.
Moisture	4.72	6 54	6 78	5.68
Fat	1.91	2.72	2.21	6.81
Grape sugar	6.02	23.29	6.06	5.78
Cane sugar	32.93	21.40	30 50	36.43
Starch	40.10	34.55	38.48	30.85
Soluble carbohydrates	44.88	46.43	44.76	45.35
Albuminoids	8.23	10.26	9 56	10.54

On account of various objections to Liebig's Food, the attempt was made to supply a food which should contain the constituents of milk to a certain extent and yet should be free from the objections to which condensed milk is open. The attempt was first made by H. Nestlé, in Vevey, Switzerland, but at the present time many milk factories are in existence, including one in our country at Little Falls, New York, under the management of Dr. N. Gerber. All of these milk foods consist of cereals specially prepared in combination with milk. The preparation of the Anglo-Swiss Milk Food is stated to be as follows: Twenty parts of Russian wheat flour and twenty parts of oat-meal are made into a dough and baked. The biscuit is then ground fine, mixed with sixty per cent. of condensed milk, dried by a slow heat at 120° to 130°, ground and sufficient wheat gluten added to bring up the percentage of albuminoids to the same amount as that present in human milk. It is evident, that apart from giving a general idea of the method of manufacture, this statement cannot be regarded as correct, inasmuch as the percentage of fat in the Anglo-Swiss Milk Food analyzed is much less than that which would be imparted by sixty per cent. of condensed milk. The percentage of albuminoids likewise makes it doubtful whether any albuminoids in addition to those present in the milk and flour have been added in the form of specially prepared wheat gluten.

According to Dr. N. Gerber, (Milk Analysis, p. 70,) the various milk foods in the market vary in composition as follows:

		Average.
Water	5.0 to 10.0 per cent.	7.50
Salts	1.5 to 3.0 "	2.25
Fat	4.0 to 7.0 "	5.50
Albumen	9.5 to 18.0 "	13.25
Soluble carbohydrates	35.0 to 55.0 "	45.00
Insoluble "	15.0 to 35.0 "	25.00
Cellulose	0.5 to 1.0 "	0.75

It will be noted that Nestlé's Food departs farther from the average than any of the other preparations, and the American-Swiss approaches most nearly. The percentage of fat in the latter is much larger than in the other preparations, and the percentage of the albuminoids is likewise the greatest. On preparing these various brands, the Nestlé's, Anglo-Swiss and Gerber's were very palatable and delicate in their flavor, more so than the American-Swiss, which had a slight rancidity, connected, no doubt, with the large percentage of fat

and fatty acids. Under the microscope various milk foods had a similar appearance, exhibiting agglomerations of starch granules, globules of milk. They all gave the starch and dextrine reaction with iodine, the reaction for dextrine being stronger in the Gerber's than in the Anglo-Swiss. All had a faintly acid reaction except Nestlé's, which was slightly alkaline.

All of them have the same points in their favor, a high percentage of albuminoids, fats and salts, this being especially true of the American-Swiss. The conversion of the starchy matters into dextrine by previous baking, gives to this class of infant foods the advantages of that class of prepared cereals which have been rendered easily assimilable by a process of previous torrefaction. The addition thereto of condensed milk has both advantages and disadvantages. The advantages are, that the condensed milk is milk in a pure and safe form. Instead of being coagulated in large cheesy masses in the child's stomach, as would be liable to be the case if the condensed milk, after thinning with water, were given alone to the infant, the admixture of dextrine and torrefied milk keeps the caseine divided and causes it to form in small flakes more nearly analogous to those forming from woman's milk. The condensed milk likewise adds a noteworthy percentage of fat, which is conspicuously absent from the other infant foods. It also adds a certain amount of milk sugar and increases the percentage of albuminoids and valuable saline matters, more especially the phosphates. The principal disadvantage is, that condensed milk is preserved with the aid of cane sugar, its analysis being as follows:

Water	20.0 to 30.0 per cent.
Salts	1.5 " 3.0 "
Fat	8.0 " 12.0 "
Albuminoids	10.0 " 13.0 "
Milk sugar	10.0 " 15.0 "
Cane sugar	30.0 " 45.0 "

Cane sugar, therefore, being relatively by far the largest constituent, there soon arrives a point in the manufacture of milk food when the addition of condensed milk must cease, otherwise the percentage of cane sugar, which, like other carbohydrates, is very objectionable when it takes the place of a proper amount of albuminoids, would become excessive and indigestion thereby be induced in the infant using such food. The remedy, it appears to me, would be found by using a condensed milk preserved without the use of cane sugar, and since this

can now be successfully effected by means of Appert's method, the preparation of a milk food not open to the above objection should be soon satisfactorily accomplished. In that case we should have an infant's food with a very high percentage of albuminoids and a low percentage of carbohydrates. The sugar would be present in the form of milk sugar derived from the milk and as grape sugar derived by a process of torrefaction from the meal. The last, in its turn, would not have to be present in larger amounts than what are requisite to supply the starch and dextrine, which are of use to prevent coagulation of the caseine in large flocks.

G. *Liebig's Infant Food.* It is not necessary to discuss here the evidence by which physiologists have established the fact that in the earlier stages of infancy only very small amounts of starch can be digested. But, accepting this fact, it is our present purpose to discover how far the difficulty has been overcome in the case of any of the infant foods. In so far as the starch was rendered soluble and converted into glucose and dextrine, the various baked farinaceous preparations were commendable. But inspection of their analyses shows that even in the most successful cases this conversion is but partial. In order to render it complete, Baron Liebig proposed to resort to a chemical process and to transform the starch into saccharine under the influence of the diastase contained in malted grain.

The following is the best way of preparing this food: Half an ounce of wheaten flour and an equal quantity of malt flour, seven grains and a quarter of bicarbonate of potassium and one ounce of water are to be well mixed; five ounces of cow's milk are then to be added, and the whole put on a gentle fire. When the mixture begins to thicken, it is removed from the fre, stirred during five minutes, heated and stirred again till it becomes quite fluid, and finally made to boil. After the separation of the bran by a sieve, it is ready for use. By boiling for a few minutes it loses all taste of the flour. (*London Lancet*, Jan., 1865, quoted in Diseases of Children, Dr. J. L. Smith.) The objections to this formula are that while it requires no more skill and practical knowledge than parents should have, yet, as a matter of fact, many mothers are lacking in both, and the operations of straining and of heating to a proper temperature, which, as a matter of fact, should not exceed 150° F., about which temperature diastase undergoes decomposition, would either not be properly performed or the necessity of resorting to the labor would effectually deter the nurses from preparing Liebig's foods. For these reasons its prepara-

tion has fallen into the hands of manufacturers, and it is claimed by them that the husk is carefully freed from the malt and the malt finely ground, that the wheat flour is lightly baked prior to use and the conversion of the starch, under the influence of diastase, is watched with the aid of a thermometer. The composition of the three varieties of Liebig's Food principally sold in this country, is given in the following table:

	Horlick's.	Hawley's.	Mellin's.
Moisture	3.39	6.60	5.00
Fat	0.06	0.61	0.15
Grape sugar	34.99	40 57	44.69
Cane sugar	12.45	3.44	3 51
Starch	none.	10.97	none.
Soluble carbohydrates	87.20	76.54	85.44
Albuminoids	6.71	5.38	none.
Insoluble residue	2.62	.....	9.41

All of these are dry foods in brown or yellow masses and very sweet, the Mellin's food looking and tasting very much like pulverized molasses candy. Their aqueous solutions, besides this sweet, had an after taste of alkaline salt. Under the microscope, Horlick's food exhibited very few starch granules, some cellulose, hairs of wheat, but mostly dark bundles of entirely unrecognizable granular matters, probably converted starch. Mellin's food goes almost entirely into solution and I failed to recognize under the microscope the minute irregular granular matter left behind. The materials sent to me by the manufacturers of Horlick's food, as representing their regular consumption, consisted of fine white wheat flour not baked, good barley malt and pure bicarbonates of potash and soda. Singularly enough, the reaction of the Horlick's food analyzed was acid. That of the Hawley's food was acid likewise, while the Mellin's food was alkaline.

The analyses reveal certain striking points in connection with these Liebig's foods. The percentage of fat is extremely low, that of grape sugar very high. In Horlick's and Mellin's there is no unconverted starch, in Hawley's 11 per cent. In Mellin's there were no albuminoids and in both the others the percentage was very low, that in Horlick's, the larger, being but 6.71 per cent. I fail to understand the entire absence of albuminoids in Mellin's food, the only ready explanation, which is that neither wheat nor barley malt was used in the preparation, being one which I am loath to entertain. From its

analysis, it would appear to contain but little else except 46 per cent. of sugar, nearly as much dextrine, saline matters and insoluble residue.

The objectionable feature in all this class of foods is their extremely low percentage of albuminoids as compared with the carbohydrates. This objection would be fatal to their continued use, unless when accompanied by a sufficient amount of milk to change entirely the relative proportion of their ingredients. This being the case, and the required amount of milk being large, their quality as food would largely depend upon the quality of the milk used in connection with them.

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27. *Keasbey's and Mattison's.* The advertisement states that this is an extract prepared from malted grain, consisting of grape sugar, dextrine, alkaline phosphates, etc., and that it is perfectly free from starch. It does not resemble the various preparations of Liebig's foods in the market, although in composition most nearly approaching them. It has, as the advertisement states, no starch, but at the same time does not contain any albuminous matter, and this is inexplicable in case malted grain were used in its preparation. The amount of grape sugar contained in it is very large. It gives the reactions for dextrine and has a very sweet taste, resembling both in taste and appearance some variety of molasses or syrup. Its reaction is neutral. It contains:

Moisture	27.95	per cent.
Fat	none.	
Grape sugar	36.75	"
Cane sugar	7.58	"
Starch	none.	
Soluble carbohydrates	71.50	"
Albuminoids	none.	
Insoluble residue	0.55	"
Salts	0.92	"

ANALYSES OF INFANTS' FOOD.

	Moisture.	Fat.	Grape Sugar.	Cane Sugar.	Starch.	Soluble Carbohydrates.	Albuminoids.	Gum, Cellulose, etc.	Insoluble Residue.	Total.	Reaction.
Baby Sup, No. 1	5.54	1.28	2.20	11.70	61.99	14.35	9.75	7.09	....	100.00	Neutral.
Baby Sup, No. 2	11.48	0.62	2.44	2.48	51.95	22.79	7.92	5.24	....	100.00	Slightly alkaline.
Gerber & Co.'s Milk Food	6.78	2.21	6.06	30 50	38 48	44.76	9.56	....	....	101.79	Slightly acid.
Ridge's Food for Infants	9.23	0.63	2.40	2.20	77 96	5.19	9.24	....	....	102.25	Neutral.
Victor Baby Food	7.49	1.62	0.62	19.92	63.45	20.54	8.87	....	....	101.97	Slightly acid.
Anglo-Swiss Milk Food	6.54	2.72	23.29	21.40	34.55	46.43	10.26	....	....	100.50	Slightly acid.
Horlick's Food for Infants	3.39	0.08	34.99	12 45	none.	87.20	6.71	....	2.62	100.00	Slightly acid.
K. & M. Infants' Food	27 95	....	36.75	7.58	none.	71 50	none.	....	0.55	100.00	Neutral.
Nestlé's Milk Food	4.72	1.91	6.02	32.93	40.16	44.88	8.23	....	0.08	100.00	Slightly alkaline.
Hawley's Liebig's Food	6.60	0.61	40.57	3.44	10.97	76.54	5.38	....	....	100.10	Slightly acid.
Hazard's Graham Farina	9.12	0.81	2.19	2 49	69.68	6.35	8.48	5.56	....	100.00	Neutral.
Cereal Milk	9.33	1.01	4.60	15.40	58 42	20.0[illegible]	11.08	....	....	100.16	Slightly acid.
Mellin's Food	5.00	0.15	44.69	3.51	none.	85.44	5.95	....	3.46	100.00	Slightly alkaline.
Blair's Prepared Wheat Food	9.85	1 56	1.75	1.71	64.80	13.69	7.16	2.94	....	100.00	Neutral.
Savory & Moore's Infants' Food	8 34	0.40	20.41	9.08	36.36	44.83	9 63	0.44	....	100.00	Neutral.
Hubbell's Prepared Wheat Food	7.78	0.41	7.56	4.87	67.60	14.29	10.13	undet.	....	100.21	Neutral.
American-Swiss Milk Product Co.	5.68	6.81	5.78	36.43	30.85	45.35	10.54	0.77	....	100.00	Acid.
Wheat Flour for Hubbell's Wheat Food	9.02	1 01	2.34	2.46	76.07	5.66	6.40	....	....	....	Neutral.
Imperial Granum	5.49	1 01	trace.	trace.	78.93	3.56	10.51	0.50	....	100.00	Neutral.
Robinson's Patent Barley	10.10	0.97	3.08	0.90	77.76	4.11	5.13	1.93	....	100.00	Neutral.
Farwell & Rhine's Gluten Flour	12.67	0.84	2.23	1.42	68.36	7.23	10.39	0.51	....	100.00	Neutral.

CONCLUSIONS.

It will be manifest, I think, from the foregoing results and remarks that I have arrived at conclusions quite different from those authors who would severely condemn all the very numerous kinds of infants' foods at present manufactured, and who would stigmatize the manufacturers as dishonest in their representations and in their goods. Neither am I able to agree with the statements found on so many of the labels, that certain foods are the only or the best possible infant foods. I am impressed with the very great amount of study and labor which most of these manufacturers have expended, and what I have to say in the way of objection is based not so much upon the shortcomings of manufacturers as upon certain imperfections unavoidable in particular classes of foods. To recapitulate, these classes are three in number: The prepared farinaceous foods, the Liebig's, and the milk foods. The first variety are in no case, and cannot be by any process of cooking or baking at present known, so far altered in composition that the largest portion of their starch is converted into sugar and dextrine. They are, of necessity, mainly starch, and for this reason are not well adapted for infant food. The Liebig's foods are very deficient in albuminoids. Two of them are entirely without albuminoids, the Mellin's and the Keasley & Mattison's, and they should be made better to conform to Liebig's standard. The Liebig's foods are excessive in the amount of carbohydrates, and this excess of saccharine matters, etc., must still exist even after the addition of milk. They cannot be made in this way to exhibit such a ratio of carbohydrates to albuminoids as exists in human milk. The third class, the milk foods, has about half the amount of starch which is present in the first class and about the same amount of albuminoids. It is open to the great objection that its ratio of saccharine matters to the albuminoids is still too high. Whilst the market supplies us many more or less excellent infant foods, one not open to these objections and entirely satisfactory has yet to be made.

REPORT OF WILLIAM K. NEWTON, M. D.,

ANALYST AND MILK INSPECTOR.

Dr. E. M. Hunt, Secretary State Board of Health:

DEAR SIR:—I herewith transmit my third annual report:

The law for the prevention of the adulteration of milk was very much changed by the Legislature this year, and was revised and passed under a new title. The alterations made in the law of 1881, by the new act, are as follows: The mark on cans containing skimmed milk was required to be of metal and the letters thereon to be at least two inches high; the standard of total solids was reduced from thirteen per cent. to twelve per cent.; the method of making complaints and conducting trials was defined and made clear; the Inspector was authorized to appoint assistants at a salary of not more than five dollars a day. The most important change, however, was the introduction in the law of a plan for disposing of the samples of suspected milk before a complaint was made against persons violating the statute. This plan is as follows: the Inspector is required to take a sample, seal it up in a suitable vessel in the presence of a witness and transmit it to a member of the Council of Public Analysts. This takes all responsibility away from the Inspector and the burden of proof of adulteration lies with the chemist.

The new law has worked well but less rapidly than the old one; many cases have been passed over because of the difficulty of obtaining persons willing to act as witnesses to the sealing of the sample, and I have been compelled, in a number of instances, to require the dealer to be a witness.

I have appointed but three assistants, under the law, for the following reasons: my desire has been to keep the running expenses of my

department at a minimum, and I did not want to open the door to a long list of salaried assistants; and thoroughly honest and capable men, who are willing to do the work in a proper manner, are hard to obtain.

In Newark, Mr. Henry Negles was commissioned an assistant, without pay, and placed under orders from Dr. F. B. Mandeville, health officer of that city. Mr. Negles was well drilled by me in the duties of milk inspection, and when I deemed him competent was placed in charged of the work in Newark.

At no place outside of New York city has such a vigorous warfare been waged against dealers in impure milk as that carried on in Newark. At least seventy complaints have been made in that city and Mr. Negles is to be congratulated on his success and the city of Newark may well be proud of so efficient and capable an officer.

Dr. Edgar Everhart, of Hoboken, was appointed assistant for Hudson county, on a reasonable salary. He has done telling work in Hoboken and Jersey City.

Mr. Peter Vandegrift was commissioned for the southern and western part of the State, and is at work under my orders and to aid the local authorities.

I have personally visited nearly all the dairy sections of the State, but as a detailed account of the work done would be a repetition of my last report, I do not think it necessary to lengthen this report by relating it.

Eighteen complaints against persons engaged in selling impure milk have been made by me and they have been disposed of as follows: seven persons have been discharged by the courts on account of mitigating circumstances, they paying all costs of court; six have been fined fifty dollars each; five cases are still pending in the courts.

The arrangements made with analysts have been very satisfactory, and the terms agreed upon are advantageous to the State. The fees accepted by these gentlemen are so low that love for the work, and a desire to aid the authorities, must have been the only motives.

The law has proved of great value to the milk producers of Sussex, Hunterdon, Passaic, Morris, Essex, Somerset and Middlesex counties, and has assisted them in making better terms with the dealer and consumer. As the enforcement of the law has kept out of market large quantities of impure and impoverished milk, the pure article has been able to command a better price. In the above-mentioned counties, I am assured by all honest dairymen that the law has been a great

boon to them, and, as at least two-thirds of the milk produced in the State and used as food comes from these counties, we may claim that the majority of producers are satisfied with and are in favor of the law

I am sorry to say that the producers in the western section of the State are not yet satisfied with the statute and still think it harsh in its operation. Hardly a complaint is made against an offender in that part of the State without the cry of oppression being raised. I can only account for this dissatisfaction by assuming that there are false prophets or ill-advised agitators misleading the dairymen.

I may be pardoned for re-opening the discussion of the vexed skimmed milk question, if the importance of that question is understood. The section in our law allowing the sale of skimmed milk, if the cans are properly marked, was thought by some to settle the matter and to prevent fraud, but the tag or label is now used by shippers to mislead inspectors. Large quantities of impoverished milk are sent to market in legally-marked cans and sold to consumers as pure milk. Permission to sell this fraudulent article is but permission to defraud the public. I venture to say that the sale of skimmed milk would be reduced to a very small quantity indeed if the public knew what it was purchasing. I can see no method of checking fraud in our milk supply and at the same time enabling our farmers to get a living profit out of the milk they raise, if skimmed milk is allowed to be sold; and I am fully persuaded that the radical measures adopted in New York are the best for the public.

I will in closing reiterate what I have many times written in reference to our milk law, and that is, I am of the opinion that the food adulteration law is fully competent to cope with the adulteration of milk, and the Inspector should be required or authorized to make his complaints under that law.

Paterson, December 28th, 1882.

Respectfully submitted,

WM. K. NEWTON, M. D.,

State Inspector of Milk.

CIRCULARS AND LAWS SINCE JANUARY 1, 1882

CIRCULAR F (XXVI.)

As to Contagious Diseases of Animals.

In addition to diseases already noted in the five former circulars of this Board, a few others have attracted our special attention because of their occurrence to a greater degree than usual in this State.

DISEASES OF HORSES.

An epizootic, or general influenza among horses, has prevailed at various times in different countries. It has never prevailed so extensively in this country as it did in 1872–3, when, like a traveling epidemic, it commenced in Canada and proceeded with quite equal pace toward the south until it extended over the entire United States and Mexico. While its origin is unknown, its communicability seemed to be established from the fact that horses escaped on those islands to which others were not brought from the mainland, and that animals kept away from others and not brought out of their stables, sometimes escaped. The best account of the epizootic and of its methods of treatment, is to be found in the history of it by Dr. A. B. Judson, Professor Andrew Smith, and Professor A. F. Liautaud, as contained in Vol. I. of the "Reports and Papers of the American Public Health Association," pages 88–109, and in the paper of Prof. James Law, as contained in the Report of the Department of Agriculture (U. S.) for 1872.

There was a slight recurrence of the disease in some parts of the United States in 1881–2, and in localities in this State it was quite common, although generally in a much milder form. It is a disease which has great variations in severity and in its class of symptoms

and lesions. From the fact that the mucous membrane of the eye, in sympathy with that of the pulmonary organs, is often pink with a tinge of brown or yellow, it is frequently know as "pink eye." This was its more common name as it prevailed with us the last season. About the same time it prevailed extensively in Glasgow and other parts of Scotland. The following outline and treatment of the disease as given by W. M. Anderson, Jr., before the Scottish Metropolitan Veterinary Medical Association will serve as a valuable guide:

"The disease presents itself in several forms, which may be classified under four heads, viz., Catarrhal, Œdematous, Rheumatic, and Irregular. In all four forms the primary symptoms are alike, namely, dullness and languidness, then loss of appetite. At this stage we can, as a rule, determine what form the disease will assume. If Catarrhal, the animal has a slight cough, tumefaction of the submaxillary glands, with watery discharge from the nostrils, and the usual febrile symptoms, namely, increased temperature and rapid pulse; the conjunctiva has a yellowish appearance, and all the mucous membranes visible are injected. The pulse is seldom over eighty, more frequently ranging from fifty-five to sixty-five, the temperature varying from 101°–105° Fahr.

"I consider the disease takes four days, as a rule, to mature, at which stage the foregoing symptoms are increased. The previously injected mucous membranes become yellow; the animal gets very weak, in fact, staggers greatly; rapid emaciation sets in, still there is no inclination to feed, and it seldom lies. This state of matters generally continues for two or three days before convalescence sets in. The first convalescent symptoms are the eye brightening up and the animal showing an inclination to feed. It is astonishing how soon the patient recovers after convalescence sets in; the symptoms disappear as rapidly as they appeared, and in a few days the animal is apparently in good health. The fatal terminations of this form of the disease are generally due to pleurisy or gangrene of the lungs. When the disease assumes the Œdematous form, after the primary symptoms the eyelids swell, then the legs—more especially the hind ones—tumefy considerably, and the sheath, as a rule, is greatly swollen. There are the usual febrile symptoms, with quick, weak pulse, and urine high colored, and often, but scantily, passed.

"The mucous membrane is infiltrated with a yellow fluid; there is great thirst. but no inclination to feed; rapid emaciation sets in, and in a number of cases diarrhœa is present. This form of the disease also takes about four days to mature. The eyelids are then completely closed, the pulse generally ranging from eighty to one hundred, the temperature from 102° to 105°. As a rule several days elapse before convalescence sets in, and recovery is much slower than in the preceding form. Should death take place, it is generally through sheer prostration.

"In the Rheumatic form, which I must say is the most peculiar, we have loss of appetite and the mucous membrane injected; there is great lameness in one or more limbs, oftenest in the off fore, without any apparent cause. The animal has an anxious look, as if suffering acute pain. The febrile symptoms are present, accompanied by an intermittent pulse; the lameness sometimes changes from one limb to the other; the back is in some cases 'roached,' and when the animal is moved it generally inclines to one side or the other. There is a difficulty in micturition, and the urine is highly colored. This form takes about ten days to run its course; and

often the lameness continues for several days after the other symptoms have disappeared.

"The fourth form, which I have called 'Irregular,' includes all the complicated forms of the disease. The usual symptoms of fever and jaundice are present, but in some cases we have diuresis accompanying them, in others partial paralysis, again in others colicky pains, all of which require different treatment, according to their respective symptoms. I cannot say much regarding the *post-mortem* appearances of this disease, as I had only one opportunity of witnessing an examination of a horse which was said to have died from the disease, and from all appearances emaciation was the cause of death. However, the mucous membrane all along the intestinal track was infiltrated with a yellow fluid, and the liver was enlarged. My treatment for this disease of course varied according to the symptoms present; but in every case in which fever existed the first thing I did was to rub the whole surface of the body with *acetic acid and water*. If the animal had a fine skin I mixed one part of the acid with two of water, but with draught or coarse-skinned animals I used equal parts. After rubbing the body and legs with this mixture, I ordered the animal to be well wrapped up in several blankets, from the head backwards, and the limbs to be bandaged; I also put half an ounce of nitrate of potash and fifteen mimims of Fleming's tincture of aconite in half a pailful of cold water, and allowed the animal to drink it as he pleased. After the blankets had been on an hour I had them removed, and usually found the animal perspiring profusely. Having had him rubbed dry, and applied soap liniment to his throat and region of the liver, dry blankets and bandages were put on, and he was removed to a comfortable box or stall. The only food I allowed him was a few *sliced carrots*, mixed with some wet bran, and a handful of oats three or four times a day. In the Catarrhal form I generally applied the liniment to the throat twice a day, and in a few cases had to blister the throat with cantharides. I kept water with aconite and potash constantly before him, allowing him three to five doses in the twenty-four hours. However, after the first administration I limited the dose to two drms. nit. potass., and ten mims. aconite. If the fever continued, without showing signs of abatement, twenty-four hours after my first visit, I again applied the acetic acid and water.

"When I feared the disease extending to the chest I applied a counter-irritant, and gave sulph. ether two ounces, and camphor two drms., twice daily. In the Œdematous form, besides applying the acetic acid and water to the body, and the liniment to the throat and region of the liver, I ordered his legs to be rubbed with mustard and water, the strength being one-quarter pound of mustard to a gallon of water, and then bandaged. I also gave mineral tonics in the form of balls.

"In the Rheumatic form I gave two drms. salicylic acid twice daily and applied acetic acid to the affected limb or limbs. In the Irregular form my treatment, of course varied. When diuresis was present I substituted carbonate of soda for nitrate of potash, and gave plenty of mashed linseed, also occasionally giving two drms., iodide of potassium. When partial paralysis presented itself, I gave sulph. quinine and nux vomica. My opinion regarding the treatment of this disease is, that good nursing and comfort have more to do with the recovery of the patient than all the medicine we may prescribe."

PREVENTION OF CONTAGIOUS DISEASES.

Two points in respect of the contagious diseases of animals still need to be urged upon farmers and dealers. Because they are animals the

laws of their well-being are definite and precise. If they are badly reared, ill-fed, badly kept, and if allowed to live amid their own filth, when it is in a state of decomposition or putridity, or to drink of water that is polluted, it is to be expected either that they will not thrive or that pestilences will occur. With swine especially, it is now quite well known that most of their diseases are primarily the result of enforced filthiness, and some of the diseases of other animals have a similar origin. Next, it is to be remembered that most of these communicable diseases among animals are transportable, and so arise by contact with diseased animals or with their secretions. As droves of cattle in course of conveyance, or while kept in city stock yards are greatly *exposed, it is never wise to place unknown and newly purchased animals with the general herd or flock, or in adjacent stalls until at least thirty days have elapsed. Even longer where any contagious disease prevails.*

INOCULATION FOR PLEURO-PNEUMONIA.

Within the last year an important paper has appeared on inoculation as a preventive of pleuro-pneumonia by R. Rutherford, M. R. C. V. S., of Edinburgh, which seems greatly to encourage the hope that some former risks are removed, and that when properly performed, we possess in it a means of limiting the prevalence of this destructive disease. His paper is contained in the June and July numbers (1882) of Fleming's Veterinary Journal. He states his conclusions in the following summary: 1-10, *see page* 30, *Veterinary Journal, July*, 1882.

"1. Inoculation is based upon the theory of pleuro-pneumonia being an eruptive fever.

"2. Inoculation is the application to a healthy animal of the virus of pleuro-pneumonia.

"3. Inoculation does not produce pleuro-pneumonia.

"4. An inoculated animal does not infect another animal.

"5. An inoculated animal cannot contract pleuro-pneumonia.

"6. The time occupied by the operation is from four to eight weeks.

"7. Inoculation in the case of milch cows does not materially interfere with their milking.

"8. Inoculated animals thrive better after the operation, and are stronger and freer from other ailments than those not inoculated.

"9. The loss arising from the operation need not exceed two per cent.

"10. From the fact that an inoculated animal is exempt from the disease, and that the average time required to develop and mature an inoculation is from fourteen to twenty-one days, that period may be accepted as the time required to arrest an outbreak."

He insists upon exact methods of procuring, preserving and inserting the lymph. His success fully justifies the provisions of our present law, while it shows the inadequacy and danger of the operation in unskillful hands.

In the April Veterinary Journal of 1882, its editor, George Fleming, F. R. C. V. S., says:

"By a long-continued series of experiments on animals, Dr. Willems, of Hasselt, Belgium, has succeeded in perfecting a method of protective inoculation, which is certain in its results. Further experiments with the cultivated germs of the virus are now being carried on with a view of obviating troublesome accidents which sometimes accompany the inoculation, and with every prospect of success."

The same distinguished authority, in reply to an inquiry addressed to him by this Board, says:

"Inoculation as a protective measure for bovine contagious pleuro-pneumonia, has been, and is now most extensively practiced on the continent of Europe and in this country, and there is no evidence that inoculated animals, while suffering from the immediate effects of the operation, can communicate the disease. There is only one such instance recorded (it is given in the Vet. Sanitary Science and Police,) but the circumstances attending it throw great doubts upon its correctness. I, myself, discredit it. I have absolute faith in the effects of the operation as a prophylactic measure, and would most certainly counsel its adoption where the disease prevails, subject, of course, to suitable precautions as to the time and manner of performing the operation. This should be as carefully attended to as vaccination is with children."

ANTHRAX OR SPLENIC FEVER.

Since the cases of *malignant anthrax*, or splenic fever, in Salem county, a few similar cases are thought to have occurred in Hudson county. The seriousness of the disease is shown by its ravages in some European countries, and especially in Russia. Prof. Tyndall informs us that in the single district of Novgorod, in Russia, between the years 1867 and 1870, over 56,000 cases of death by splenic fever among horses, cows and sheep were recorded. Nor did its ravages confine themselves to the animal world, for during the time and in the district referred to, 528 human beings perished in the agonies of the same disease. The causes and cure of the malady are well summed

up by Prof. Law in an article in the second report and papers of the A. P. Health Association, page 467: "The most universally acknowledged causes of the malady in animals are plethora, or a state of blood highly charged with organic elements, an impervious soil or subsoil for pasturage, a very rich surface soil, inundations, a period of heat and dryness, calculated to foster decomposition of organic matters to a great depth in the ground, and a great contrast between the night and day temperatures. * * * While this affection is communicable to animals by inoculation, it can scarcely be said to spread in any other way, and is, therefore, to be looked upon as essentially an enzöotic disease. We must go to such places as the inundated margins and deltas of large rivers, dried-up lakes and marshes, or the rich and pestilential Russian steppes, to find any approximation to the disastrous outbreaks in man and beast which blacken the history of past ages." What was done in the cases reported by Prof. Law to check the disorder, remains to be noted. One hundred of the best steers were turned on a higher pasture with a gravelly subsoil. The remainder were, of necessity, left in the higher of the two meadows formerly occupied, but were fenced out from the swamps and low meadows where the clay approached near to the surface. Antiseptic methods of treatment were used, and most of the cattle recovered. In the cases occurring in Salem county, the bacillus anthracis was detected.

TEXAS, OR SOUTHERN CATTLE FEVER.

This is generally regarded as allied to anthrax or splenic fever. Its classification cannot be said to be settled. It is not believed that it has the same law of contagion as the malignant anthrax of Europe, or as similar outbreaks which occasionally occur in this country.

The disease, although communicable, is not regarded as contagious in the general sense. D. E. Salmon, D. V. M., a veterinarian of the National Agricultural Department, says:

"The real danger exists in the pastures or other grounds over which Southern cattle, whether sick or well, have traveled." If other cattle are turned in the same pastures or go along the same roads, they are liable to contract the disease. The sick animal does not, because of his sickness, impart the disease, but the apparently well Southern cattle seem to carry the contagion of the disease, and will impart it to the pastures in which they feed, or the roads on which they travel, although, even afterward, not showing it in themselves. It is even claimed that a sick Southern animal does not infect the

pastures, while those from the South, which have sickened by pasturage or by driving on fields or roads infected by apparently well Southern cattle, do infect them. This would suggest the idea that it is only at a certain stage that the infective particle is transmissible. Also, it is believed that Northern cattle, which have contracted it through road-driving or pasture, will not impart it to other cattle, either directly or by means of pastures. We cannot yet regard the history of this contagion as so definitely settled. Two outbreaks, confined to Texas cattle brought into this State, have occurred this year —one in Salem county and one in Burlington county. No extension of the disease has occurred. It is therefore important to state what is to be done in such case, both so as to exercise due precaution and to avoid unnecessary alarm.

The sick Southern cattle should be "quarantined upon the infected pasture," where they cannot come within one hundred feet of other animals. They should be securely fenced upon the infected pasture until after a killing frost. Such as die should be buried beyond the reach of dogs. The question of slaughter must be left to local authorities, but, by most, this is not considered necessary in order to check the extension of the disease. Until more settled views are entertained, we recommend the same course in case of native cattle which may have contracted the disease. It is not necessary to quarantine all the cattle, but only those sick and the fields in which they are. Purchasers of Southern cattle should not allow other cattle, until after severe frosts, to be upon or go over the same ground on which they are left. It might become necessary for a township to prohibit the bringing in of any cattle from districts infected with Texas fever. The danger is the more insidious from the fact that the ground over which they pass or the excretions they leave upon it impart the disease. The "ticks" which are found upon the cattle may help in determining whence they came, but they have no relation to the disease.

There is no specific treatment known for the disease. The usual course of veterinarians is to give oils or mucilaginous drinks and nitre, or some other form of diuretic, to relieve the dryness of the fourth stomach and the congested state of the alimentary tract, the congestion of the liver or spleen, and the bloody urine. Where there seems to be much pain, opium is freely administered. Many recover, but the relation of treatment to their recovery is not always known.

The meat of any animal affected with the disease is not fit for use. It shows putrefactive changes so marked as not even to be classed with the meat of some of the more diffusive contagions.

The former circulars of the Board contain information as to all the other communicable diseases which have occurred in the State for the past year.

NOTE.—Copies of all these circulars, in pamphlet, can be had by postal addressed to State Board of Health, Trenton.

Trenton, January 4th, 1883.

CIRCULAR XXVII.

As to Sanitary Instruction and Training in Schools.

At its last session, the Legislature of the State of New Jersey, in Chap. CLXV., Sec. 2, enacted the following provision:

And be it enacted, That the State Board of Health shall be directed to confer with the trustees of the State Normal School as to definite instruction to be given in the practical care of the health of teachers and pupils, and as to provisions for such instruction.

At a meeting of the New Jersey State Board of Health, held at Trenton, the subscribers to this circular were appointed a committee to endeavor to secure in the public schools of this State such instruction in Physiology, Hygiene and Sanitary Science and Practice as shall most efficiently carry out the objects for which the Board was established, viz., the health, the happiness and the prosperity of the people of the State. To this end, we appeal most earnestly to all who are interested in the educational work of this State. State and local Boards of Education, trustees of the State Normal School, of colleges, academies, seminaries and of local districts, State, county and city superintendents, principals and teachers in all our institutions of learning are asked to consider most seriously and aid most effectually in instituting and carrying out a scheme for such instruction as we have indicated.

We would call your attention to the fact that the primary object of the public school system of the State is to secure good citizenship. There can be no complete citizenship without a knowledge of and obedience to the laws of one's own being and the laws of society—civil, sanitary and social. With these, it is safe to say, we shall secure among all classes of the community the best health, the highest productivity—moral, intellectual and physical—and the greatest amount of well-being and happiness. We would remind you that,

hitherto, the laws of one's own being and those of communities, constituting the great body of facts known as hygiene and sanitary science, have been very much neglected in the usual course of public instruction in this State. Thus the young have been permitted to grow up exposed to all the dangers to life and health, which follow inevitably the disobedience of nature's laws.

Is it not practicable that some of the time now spent in teaching branches of knowledge indirectly or remotely serviceable to the learner might, more profitably to the pupil and to the State, be devoted to imparting such knowledge as must needs be practically useful every day and hour of one's life?

Is it not equally evident that the kind of knowledge which contributes directly to the maintenance of health and vigor of body and mind, the prolongation of life and the fullest development of all the faculties in a complete and perfect manhood and womanhood, must be second in importance to none other?

If this be true, is it not equally clear that instructions in such should be as systematically and thoroughly given in all grades of schools as upon any other subject? Admit these propositions, and you will agree that we need to modify, as speedily as possible, our scheme of education.

It need hardly be said that the change, to be effectual, must be radical. Teachers must be, themselves, taught. Should not the Normal School begin this work soon and thoroughly? Teachers' institutes should make it a prominent part of each meeting. State, county and city superintendents should unitedly bring to bear all their influence to secure it a place in the regular course of study in the schools under their charge, and to stimulate the teachers to give their best efforts to make it as thoroughly practical, as it will be intensely interesting when properly pursued. Boards of trustees, upon whom now devolves the duty of determining the studies to be pursued in their respective districts, should at once take steps to introduce this, the most important of all, into the course, and by faithful oversight see that it is adequately and properly taught. Not by occasional lectures here and there before bodies of teachers, not by bits of advice to pupils on the part of well-meaning and well-informed teachers can this work be properly done, but only by systematic, oral and text-book instruction, as faithfully and persistently pursued as possible, and adapted to the ages and capacities of the pupils. It need hardly be said that the subject is broad enough and deep enough to

engage the profoundest thought of the foremost scientific minds of the world; yet, its facts are the facts of every-day life, many of them so simple, so clear, as to be readily taught and practiced.

With this instruction, so adapted to all ages and capacities, we would combine physical exercises, varied, beautiful and practical, fitted to develop the bodies and strengthen the minds of the growing pupils. Thus they will secure, as the limited time they have been under training will allow, knowledge immediately serviceable in the battle of life, and bodies well fitted to put it to practical use.

The Board will cheerfully furnish names of text books suited to various grades of schools, by means of which a beginning in these subjects may be made, and when once introduced, the demand for adequate instruction will, as in England, produce multitudes of works from which the teacher may select those best suited to inculcate this needful knowledge and to train pupils in its practice.

Trenton, August 21st, 1882.

L. Dennis,
F. Gauntt,
E. M. Hunt,
Committee.

CIRCULAR XXVIII.

Sanitary School Circular of the New Jersey State Board of Health.

The State of New Jersey in its free school system makes it obligatory upon all children, between five and eighteen years of age, to attend school. It claims that the public and social welfare of the State demand this provision for the education of its children, and, in order to assure attendance, provides for it free of charge.

It may be claimed, as an axiom, that a State which thus assembles its children from day to day in public buildings which it provides, should see to it that these are divested of all avoidable unwholesome circumstances. In other words, the children in this enforced assemblage, for the State's good and for the good of its children, should not be subject to any preventible cause of disease. This means a great deal, both for the child's future and the future of the State. We cannot here discuss it in detail, but only seek to summarize what it does

mean, and what it is the duty of the State, of trustees, of teachers, of local authorities and of parents to seek to secure.

Adaptation.—It is ever to be remembered that the question of healthfulness is relative in all its parts. It is first a question of the adaptation of location and construction for the purposes designed. It is next a question of how the building is to be used in carrying out the design. Many a building well designed is only partially utilized for health, because the teacher does not understand the methods of adaptation. An overcrowded room may, in a half hour, disturb the equilibrium of a system of ventilation perfectly adapted to the school for which it was designed.

Management or the executive administration is often the essential in which there is failure. The most perfect mechanism does not run itself. Nor is it run by the good intention of the overseer. It is only knowledge of how to manage it, and faithful quickness of perception to manage it aright, that secure the satisfactory results. Therefore, nothing can take the place of knowledge and attention on the part of teachers, janitors and other officers. But as these should not be embarrassed in their efforts by structural defects, we notice:

I. BUILDINGS, THEIR LOCATION, CONSTRUCTION, ETC.

Location should have reference to the kind of ground, as to whether it is sterile or full of organic matter; the latter, while good for plants, is not needed for school children.

Next, is it sandy, gravelly, clayey or rocky? Is it wet, swampy or dry? Well drained or ill drained?

In this respect school-houses are best located on dry ground, or such as has been made so by thorough drainage. If the ground is such that a cellar would be likely to be damp, the building is better to be placed on a foundation raised from the level sufficiently to admit of free circulation of air beneath. The contour of the ground should be made slightly to decline in all directions from the building. Water from the building should not be allowed to run off and soak in the ground adjacent thereto.

The school-house should not be closely surrounded by trees or by buildings on the sides where there are windows, because light and not shadow is needed. Excessive sunshine within the building must be guarded by outer or inner blinds. As a rule, the sunlight is best distributed when the corners conform to the four cardinal points.

Construction.—The material for construction is the same as that adapted for the best houses. But, as for two days in a week, or at vacations, the building is not occupied, and only for part of the day at other times, heating and ventilation are less regular, and dampness is more apt to occur than in well-managed private dwellings. If brick or stone is used, the damp-proof layers are often important, as well as wainscoting and a little deeper furring than usual.

Thirty-eight by twenty-three feet is about the model shape of rooms, according to the best authorities, with not less than twelve feet of ceiling. These dimensions are determined by laws as to light, sound and capacity. This size would be adapted to about forty scholars at most.

Windows need to be set with reference to the size and shape of school rooms, and, if wrong, should be altered in buildings already erected.

Windows should reach nearly to the ceiling, and may come within about three and a half or four feet of the floor. It is best to have the light diffuse itself from above the level of the pupils. The upper part of the windows and the ceiling serve to send down the light. Porticoes or projecting roofs or window-ornaments should not be placed on the outside so as in the least to obstruct the light.

Inside blinds or shutters are convenient, as these may be adjusted to keep out the rays of the sun or to regulate the light. Ceilings should be white, as they thus help to reflect the light. The walls are best of gray or some neutral tint.

Light should not enter directly in front of where the pupil sits. As the right hand and side are used most in writing, drawings, etc., for many purposes light from the left side is better. The Germans so insist upon this as to build school rooms with windows on the left side only. Light can also be let in from above. Blackboards or slates between windows receive the light unfavorably. Eyes and eyesight are often imperceptibly injured in our school rooms.

Doors should be wide and open outward. As they often connect with entry-ways, and when wide open cause draughts, they are not so safe for ventilation as windows. A transom window over the door is better for ventilation. They should generally be self-closing.

Stairs should be of easy rise and with platforms rather than spiral. School-houses should seldom be over two stories in height. Frequent stair climbing is, for many, not good exercise, and those in the upper rooms, in order to avoid it, often remain in at recess.

Entries should be roomy. Often there is need of an extra hall and

stairs or other fire escapes, since, in alarm or panic, children cannot be expected to have deliberate forethought.

Hard finish is generally the best for walls. They should be very smooth, as dust clings to rough surfaces. Paper is too absorbent for school walls.

Rooms in which outer garments or wet clothing, baskets, etc., are kept, should have ventilation, and pegs or shelve-pockets should be so arranged as not to crowd any soiled or wet clothing.

A small wash room, with hand basin, is needed in most school-houses, and would greatly promote cleanliness. The Chinese towel, or other towel paper, obviates the necessity of a towel in common.

School Desks.—These should be arranged with reference to the places where light or heat enters, and to the positions of teachers. They should not be against walls. Children with defects of hearing or seeing should be located with special reference thereto. Each pupil should be able to touch the floor or a foot-shelf easily with the feet. The seat should have its edge on a line with the lower edge of the desk. This preserves the best posture. When the child is sitting erect, and the elbows hanging freely by the sides of the body, the part of the desk next to him should be two inches above the line of his elbows.

The slope of desks should be at an angle of about 10°, or slightly varying from it. It is better if this admit of slight variation, according to the preference of the pupil or the directions of the teacher. The usual arrangements of desks, by which the seat is attached, is somewhat constrained, and does not admit of that change of posture and successive rest of muscle which is desirable. Until there is some change in this respect, so as to admit of more comfortable seats, the chief dependence must be on that change of posture which comes from recess, from recitations or from a five minutes exercise in calisthenics at the close of each hour. Desk seats that fold up are to be preferred. The number of desks in a room should depend on the number of pupils, as even the smaller ones should not be left all the time without this aid.

PURITY OF AIR, ETC.

The capacity of a school room as to numbers, after some general indications arising from laws of light, sound, floor space and height of ceiling, is to be determined by our ability to furnish air of proper

purity, temperature and moisture for the length of time required. These, it is true, vary in some degree by varying circumstances. The purity of air is not only affected by numbers, but by the condition of the persons. It is not merely the amount of carbonic acid that may be given off from the breath. Unhealthy or dirty children contaminate the air more rapidly than those that are cleanly. A school in a tenement-house population needs greater exactness of provision and administration. Children ill clad or sickly are more susceptible than those of average health on certain days. When the atmosphere is very dry or saturated with moisture the usual laws of capacity are disturbed. Yet there is a law which is quite generally correct. The air is said to be pure when it approximates nearly to the standard of the outside surrounding air. It is regarded as sufficiently pure when the impure air being produced is being uniformly diluted by fresh air "to a certain standard of relative purity." It is found that the amount of carbonic acid in the air is one of the tests of its relative purity. Thus pure air contains 4–10,000 of carbonic acid gas. If human breath is added to it, up to 7–10,000 or 8–10,000 or more, it is sensibly close to most persons. If beyond what this indicates, the persons are giving off more than a usual amount of effete organic matter from the breath, skin, etc., the air becomes still more rapidly deteriorated.

Of all the impurities of air, that which stands highest in the scale of injury to health is organic matter. The amount of carbonic acid present is an approximate test of this. Careful examinations have established the rule that when air contains over six ten-thousandth parts of carbonic acid, it is too impure for continuous healthy breathing.

The problem is this: What is the greatest number of persons that can be, for a given time, in one and the same room, and for whom there can be introduced an amount of pure air sufficient to preserve the standard, without causing a *draught* such as might give rise to colds or discomfort?

Careful practical experiment and allowances for insensible sources of air "show that arrangements which appear to provide for a volume of air much less in amount than that obtained by calculation, will keep the room in a fair condition. These results have pointed to about 1200 cubic feet of air to be admitted per hour for each person in rooms occupied by persons in health." This gives an average admission of 20 cubic feet per minute for each person. This, in a room for fifty scholars, would be 1000 feet per minute, even without

any allowance for stoves or other sources of contaminated air or incidental variations that may occur. To supply this requisite amount in a room 25x32, with ceilings 12½ feet high, the entire air of the room must be changed *six times* each hour. We cannot, by ordinary means, move the entire air in a room oftener than three times per hour without draught. (See our 1st Report.)

The velocity of the air as it flows in and out of a room, as measured at the openings for admission or exit, should not exceed one foot or, at most, two feet per second; firstly, in order to prevent a sensible draught being felt, and, secondly, because low velocity is favorable to the uniform diffusion of the incoming air through the room.

Air should be introduced and removed at such parts of the room as not to cause sensible draught. Air flowing against the body at or even somewhat above the temperature of the air of a room will cause an inconvenient draught, from the fact that as it removes the moisture of the body, it causes evaporation or the sensation of cold. Air should not, as a rule, be introduced near the floor level. The openings would be liable to be fouled with sweepings and dirt. The air, unless very much above the temperature of the air of the room, would produce a sensation of cold to the feet. The orifices at which air is admitted should be above the level of the heads of persons occupying the room. The current of inflowing air should be directed toward the ceiling and should be as much subdivided as possible by means of numerous orifices.

When the outside air is of the right temperature, or a nearer approach thereto than we can secure by any indoor arrangements, it is wise to trust to openings between the room and the outside air for our supply. Hence, it becomes a study what these openings shall be and how they shall be regulated. Windows are among the most valuable. It is a great practical art of the teacher to know how to regulate their use. Air may often be admitted near the ceiling or between the two sashes, or be directed upward by a hood or cowl and so diffused in the room, when its direct admission would cause draught or be too cool. A strip of board under the lower sash serves to keep out direct draught and opens a space between the upper and lower sash, and so is a simple device often applicable. A wire screen, fitted in windows, admits air while diminishing draught. Openings in the side walls, such as the Sherringham's ventilator, introduce outer air and incline it upward, or such as Tobin's, receive it near the ground and inlet it above the head level.

Much can be done for the natural ventilation of school rooms by their management when unoccupied. They should be thoroughly flushed with air before and after school. This does not mean the opening of a single window, but such general opening of all outlets to out-of-doors as will allow an entire flushing of the room. At recess the same can be partially or completely done. Sometimes the opening, on account of temperature, may have to be momentary. It may often be made just after the room is vacated. Windows may be lowered during gymnastic or calisthentic exercises, even when the air would be felt too cool for a sitting posture.

ARTIFICIAL VENTILATION.

There are so many forms of artificial ventilation that it is very necessary that, where these are relied upon, teachers make themselves fully acquainted with their mode of action and so come to have judgment in their regulation. They do not take the full place of natural ventilation by windows, etc., but are of chief advantage when these cannot be used.

Artificial ventilation consists in certain forms of apparatus for bringing pure air in and getting impure air out. The chief necessity for any such arrangements arises from the fact that the prevalent temperature of the outer or pure air needing to be brought in is not comfortable, and that the impure air within has not the chances for escape or diffusion it would have outside.

Rooms, at some seasons of the year, are almost entirely ventilated by *flues*. Of these, the chimney flue and the open fireplace are the most ancient and still often very valuable. "Few people," says Dr. D. F. Lincoln, "are aware how small a quantity of air is actually drawn out of apartments by ordinary flues for ventilation. By 'ordinary,' I mean the old-fashioned sort, of the size of one or two bricks, 4x8 inches or something about that, with a close grating, called a register, to obstruct the current at the bottom, a sharp angle at the foot, the inside roughened by protruding mortar and with only an accidental opportunity of getting warmed by contact with a smoke-stack. You stand in front of it with a light pocket-handkerchief; the cloth is gently drawn toward the opening; it deviates a couple of inches; you say 'it draws' and are satisfied. 'The thing is working.' Probably, in such a case, the rate at which the current moves is something like a foot per second. The flue is drawing out a

quarter or a half of a cubic foot of air per second—enough, perhaps, for *one person's* requirements."

The one question as to a *flue* is, does it draw, or do the combined flues of a room draw sufficiently or unitedly and alternately to remove the foul air? Their drawing depends upon (a) position, (b) upon direction, (c) upon smothness internally, (d) upon relative warmth, (e) upon free exit to the outer air. As heat is the motive power, if the flue is so located as to be very cold, or if, while heated at its lower part, it is very cold at its upper part or exit, the draught will be much diminished. Different states of the air make great differences in the actual draught, and a flue that does not draw is worthless. The flue needs to be warm all along its course. Its position, its connection with a chimney in which there is a constant fire, or a gas or other light or coils somewhere near or in the tube of flue can accomplish this. Flues in outside walls generally lose heat too rapidly. Stovepipes entering chimneys near a ceiling not only heat the flue and help to cause upward draught, but, if left with slight openings around the pipe as it enters the chimney, aid in ventilation.

If the shaft or flue opens into the upper part of a school room, the air drawn out is several degrees hotter than if it opens near the floor. The draught is, therefore, more powerful. Still, it is best to carry the shaft nearly to the floor, where its effect is to stimulate the circulation of the warmed air in a downward direction and to increase the heating power of the stove. No draught will usually be felt from it by a person sitting at the distance of four or five feet. We need not be influenced by any theoretical considerations as to the level where carbonic acid is most abundant—there is no great and constant difference between different levels; but we shall not fail to find sources of impurity of air more frequent at or near the floor than higher up.

HEATING, ETC.

Both because of the need of heat and of the relation of heating to ventilation, we need closely to consider the modes of heating school rooms. Every school room should have a thermometer, and the teacher's record should tell the temperature at 9 A. M., at 12 and at 2 o'clock each day, so that the trustees may have a report of the actual changes. The practical idea, which forms our model, is somehow to get into the room air of right temperature and moisture from the outside, or to bring it to a right temperature before is is introduced into the room or is breathed by the children. If, for instance, you could

have a stove with flues all around it connected at the bottom with the outer air, so that the cold air could flow up through them to the top of the stove, and from thence be diffused through openings into the room, if all other sources of air-supply could be removed, you would thus have a constant inflow of warm, pure air for breathing purposes. Or, if such air is allowed to flow over heated coils, either of dry air or steam, it can be warmed in this way. Or if, in any way, the walls and floors of the building can be kept warm so that pure air flowing in or through them or brought in contact with them is warmed, the same object is accomplished. Most of these constructions must be left to the architect or engineer, but the mere mention shows what the intent involves. Even where construction is perfect, regulation is important. As an engine, in its running, depends on the engineer, so does most heating apparatus depend much on the skill of the operator. Both teacher and janitor need to understand this fact. The warmth needs to be such as to secure an average heat of about 70°. This suits the greatest number of children in our climate. But it is to be remembered that children are more susceptible to colds than adults, and that they vary much in their impressibility. Continued chilliness is never healthy, and hence chilly persons should have better access to heat, or by more frequent exercise or more clothing should be fortified against cold.

If heat is derived from registers through the floor, there are two disadvantages. There is apt to be foul air from the space or room beneath, and those sitting near the register receive more heat than they need. Where registers have to be used for school rooms, they should not open near desks and should be so numerous as to distribute the heat at different portions of the room near to the walls.

Where stoves need to be used, they should be such as are well started before assemblage, and as will not need to be filled up during school hours.

In order to equalize the heat, and in order to secure pure air from without, it is best to provide stoves with a jacket or metal screen. A sheet-iron screen or cylinder, about four to five inches outside the stove, is placed around it and "the edge fastened to the floor." A pipe of about six inches is then carried through the floor, under the stove, and led through the house-wall. This pipe should have a wire screen at its entrance. Through this outside air is drawn in to be heated by the fire in the stove and to be diffused through the room at points far enough above the entrance for it to have become enough heated.

The jacket may extend all around the stove, access to it for supplying fuel or removing ashes being arranged for by a movable part, or it may be tightly fastened around the stove just above the cylinder, and lead up the warm air by pipes or opening for distribution.

Grates and fireplaces have been constructed on the same principle, so as to admit fresh air on the back or sides for warming and then causing it to be directed into the room. The whole idea in either case is that the air to be warmed for breathing should not be air already reduced in purity by use in the room. Pure air should thus have a mode of ingress.

The air in the room which has been contaminated is thus replaced by good, pure air, and, at the same time, draught made, and its removal through windows, flues or other artificial ways facilitated. Flues are better not to begin too near the floor and near the ceiling and near the sides of buildings, because an outflow near the floor aids the circulation of the air through the room as well as removes its portion of foul air, while the hotter air already breathed and so having some organic matter, is carried upward near the ceiling and needs to be removed. As organic matter tends to cling to surfaces, and as air, like water, tends to flow along surfaces, these withdrawing openings for exit need to be at the sides or near surfaces.

Air as related to moisture is important, but so far as artificial heat is concerned, we need only to say here that open basins of water, and the steam and evaporation therefrom, help to make the air more agreeable for breathing purposes. It is certain, says Briggs, from all experience, that from five to ten per cent. of moisture can be added to air after it is heated, certainly with much relief, especially to the eyes, with apparently little harm, although such addition may make the occupant of a heated room a little delicate as to out-door exposure. Moisture may, to some small extent, be abstracted by the means of heating, especially when the heating is by stoves or hot-air furnaces; at all events the presence of a sheet or surface of water over which the heated air is allowed to pass, is now a recognized means of supplying a small quantity of aqueous vapor to air of ventilation. But the quantity supplied in this way is very small in comparision with what is needed for complete "hydration," or even for what can be denominated "hydration" at all, in the sense of a summer condition. From an estimate based on several winters' experience, a vaporization of water which supplied a half grain of vapor per cubic foot of air introduced, when an increment of four to six grains for the same volume of

air would be requisite to get the summer condition of humidity corresponding to the internal temperature, has proved sufficient to give a sensibly pleasant air, while the absence of this supply was at once perceptible in the house.

Whatever may be the facilities afforded by construction, it is to be remembered that administration is a study by itself, with which the teacher needs to be acquainted. The care of the room, like that of a good housewife, must be personal. The janitor is but the assistant. Although in large buildings all work must devolve upon him, the oversight must belong to the teacher. He may also need the emphasis and aid of the trustees. Most thorough cleanliness and the proper aids for securing it must be provided. This is not only a necessity for health but a part of true education.

PERSONAL CARE OF THE CHILD.

Besides the right which every child has to find a suitable room, with proper regulation thereof, it is the right of the teacher, the trustees, and of every other child, that no child should be an avoidable cause of discomfort or disease. Because of this, all that relates to the personal cleanliness and habits comes under jurisdiction of the teacher. Uncleanliness of body or of dress are always grounds of complaint. It is not difficult for a teacher to establish a standard as to these; to make clear the distinction between plain clothing and soiled clothing, and to make it popular with the children to be cleanly. The first step toward it is a thoroughly cleanly teacher. Every school should have rules, which should be read every month to the pupils, among which should be one that when any contagious disease is known to exist in a family, no scholar shall attend therefrom, except by a certificate from the city or township physician or attending physician. Cases may sometimes be so separated as that other members of the family have not had and will not have exposure, but a special certificate should affirm this. A board of trustees may need sanction by a general law to say what time after sickness shall elapse before children are returned to school. Where a teacher finds a child unwell, or has reason to suspect exposure to contagion, he should, at his discretion, send the child home and report the fact to a trustee, the city or township physician, or to the family physician. The registry should show if any have not been vaccinated, and the trustees should not permit the attendance of non-vaccinated children.

If children bring food with them it should be eaten at an appointed time, under such conditions and directions as will secure comfort and deliberation. Habits of rapid eating are often learned at school. Study and play, and relief by alternations of kinds of study and play, should be provided for. While the teacher has to deal with the school or with a community subject to general laws, he also needs to recognize the individual far more than is usual in any other class, and to adopt laws and modifications to those who differ in physical or mental or moral capacity.

CIRCULAR XXIX.

Circular as to Charitable and Penal Institutions.

A law recently passed has directed the State Board of Health to an inquiry into the sanitary condition of charitable and penal institutions of this State. The need of such inquiry has been made fully apparent in the experience of other States and countries. All such institutions have to deal with classes whose cleanliness and sanitary welfare are only secured by the most thorough administration, and by careful attention to the details of a personal and intelligent oversight. The duties of the superintendents, if well performed, are far more arduous and responsible than is generally appreciated. Successful care depends upon proper buildings and grounds; proper structural arrangements as to water-supply, sewerage, heating and ventilation; upon a proper supply of food, raiment and work; upon special provisions for those who are sick or feeble, and such personal attention by officers and assistants as unites capability and faithfulness.

In prisons and jails, most of the inmates are to return to society. The greatest care is needed that during detention there should be no habits acquired nor influences exerted which will tend to make the person worse than before. A hopefulness of promoting reform should be entertained and provided for.

In alms-houses, there should be a constant effort to limit those habits which cause pauperism, and to prevent its continuance either by custom or inheritance. Statistics prove that by wise planning the State has great capacity for limiting dependency, and that physical care enters largely into consideration when we would better the condition of such

classes. Every State has a wide duty in provision for this portion of its population, and in seeking to limit the pauperism, sickness or crime of those who have become its wards. Were it only a consideration of economy, it is to be remembered that these classes levy the heaviest tax that is paid for State, city, county and township expenses.

Asylums are so multiplying in our counties, in addition to our two State asylums, that all of them need the most careful supervision, since success of care and treatment so largely depends upon hygienic conditions.

It is easy for stewards for the poor or for the managers of institutions, to fall into routine methods, or, by want of vigilance, to allow various evils. Others have no appreciation of what proper sanitary care requires, and so approve their own plans, simply because they do not know of others which are far better. This Board, with its other duties, can only offer co-operation with local authorities in all that relates to the hygienic welfare of these classes. By comparing one with another, we shall find some that serve as models, while others will come to realize their defects. Already we have been able to suggest and aid in alterations and reforms which have met with ready response from local officers. The fourth Report of this Board can be had by addressing by postal, State Health Board Trenton, N. J. It contains—pages 89–112, pages 260–265, and pages 305–310—important suggestions for all public institutions. Local Boards of Health, as well as the immediate officers of institutions, are to remember that the sanitary condition of public buildings located in their districts is subject to their inquiry, if there is ground to suppose negligence.

Some of the most serious defects, as thus far noticed, are—

I. *As to Buildings.* (*a.*) Too little air space for living and sleeping apartments, especially in winter.

(*b.*) Too little care as to cellars and as to dampness around the dwelling.

(*c.*) An alms-house smell, only to be corrected by frequent house-cleaning and whitewashing.

(*d.*) Want of arrangements for the proper disposal of all excretions and refuse.

(*e.*) Absence of good ventilation, which, even if dependent on windows, would be much freer of draught if the windows extended near the ceiling, and if air was let in when needed by raising the lower sash and placing a strip of board all along under it, so as to make the place for the air to come in between the two sashes.

(*f.*) Stoves which bake the air and over-heat a small space about them, but do not furnish an even temperature for rooms.

(*g.*) Absence of sufficient stairs or arrangements for escape in case of fire.

II. *As to Persons.* (*h.*) Absence of accommodations for the first reception of inmates. No person should, as a rule, be received to any public institution without first having a general bath, a cropping or cleaning of the hair, and proper examination and change of clothing. As a precaution against contagious diseases, the person should be kept two weeks apart from the inmates. Vaccination is often required. Neglect of such precautions has recently cost a county in this State over five thousand dollars.

(*i.*) Absence of arrangements or of a system of thorough washing. All charities should have provisions and administration by which at least a weekly bathing is secured, unless some very special conditions of ill health forbid.

(*j.*) Absence of accommodation for special cases of sickness. A small building, separate from the rest, should always be at command for cases of malignant or eruptive fevers or other special cases that may occur.

III. *As to Managers, Committees, etc.* (*k.*) There should be monthly or quarterly inspections by directors, overseers or township committees, which should fully certify as to sanitary conditions. This not only prevents investigating committees, but prevents oversights, and is an aid to stewards and superintendents in their work. Generally, it is best to have a schedule of questions as a guide and to fill out accurate answers. As far as proper, inmates should be personally seen.

(*l.*) It is very desirable that a book be kept by every institution that will show the time of entrance of inmates, their previous history, their ages, social condition, the causes of sickness and death, and other items such as are now always registered in well-ordered institutions. That is a narrow view of a public charity which makes it a mere receptacle or retreat. Such records come directly within the line of that care of population which these are meant to subserve. One record or one year may not show much, but series of records through series of years point to methods of prevention or limitation too important to be overlooked.

(*m.*) We send with this circular a blank form of institutional inquiry, with the request that it be accurately filled out, so far as the superintendents, overseers or physicians of any State, city, county or

township institution can fill the same, and be returned within one month, by mail, to State Board of Health, Trenton. Add whatever may need to be said as to any special defects.

We are glad to furnish any information in our power, as to proper sanitary arrangements and care. So far as other duties will permit, we will, when desired, co-operate with local authorities in correcting defects or meeting special emergencies which may arise.

N. B.—The city clerk, assessor or Board of Health to which this circular is sent will please see that it promptly reaches the county or township or city alms-house or other charity for which it is intended and ask its return to us in due time.

By order of the Board.

Trenton, N. J., June 1st, 1882.

EZRA M. HUNT,
Secretary.

CIRCULAR XXX.

The observations of sanitarians in other countries and in a few of our States have led to the belief that the occurrence and the fatality f many diseases depend much upon geological structure, soil, topography, elevation and exposure, rain-fall, relations to seas or other bodies of water, density of population, and other local conditions not determined by the latitude or longitude of the locality. Thus, districts, or even small precincts, have their climate, which bears relations to the vitality of the people and governs the causes and courses of disease. It is for this reason that sanitary survey and topography have attracted the attention of the national government, and may well concern a State which presents diversities already so recognized by common observation as to have led to preferences and selections of resorts in adaptation to different kinds and phases of diseases. While these general observations are valuable, it is only by the close and confirmatory observations of experts and the tabulation of closely-noted facts that we arrive at well-sustained conclusions. It is fortunate for this State that its geology and topography are so well mapped as to afford an excellent basis for this kind of observation. After a conference with Prof. George H. Cook, the State Geologist, this Board found it feasible to supply at original cost a sufficient number of maps to a sufficient number of observers to make this kind

of observation practicable. It is proposed, in connection with medical societies and other scientific societies or individual observers in the State, to place this map in the hands of some chosen observer, who, up to the year 1885, will collect from the township or city in which he resides such data as shall enable him to estimate the relation of his particular locality to disease. The areas chosen will be townships and cities, and, of the larger cities, wards, or some more natural divisions, with a map of reference pointing out the relations of each locality, with the facts from time to time furnished by our reports and vital and meteorological data, we shall hope to give fixedness of attention and uniformity of system to the observations. Much will depend upon the choice of an observer who is painstaking, and who has some skill in accurate methods of observation.

He would first study with care the locality with which he has to deal in all its tellurial conditions. He would inquire how it varies as to degrees and moisture, how far the wells and river-beds indicate its usual and varying water-level, how the relations of valley, hills and bodies of water affect the degree of heat it receives and how prevailing winds indicate its local changes or result from its adjacent relations.

He would seek from the assessor or city clerk the deaths in the district, with age, date and place of residence in order to see whether for these years the relations of these to the general or precise locality could be discovered, and note explanatory views. To some degree, as in rheumatism or consumption, he would seek to know how far locality produced or influenced the progress of the malady. If a part of his township or ward had marked diversity from that in which he lived or over which he rode, he would select some careful observer to afford such information as appertained to his valley or hill or water front. Often a few questions at the meetings of medical men would aid to give precision in place of the casual impressions too apt to be accepted from a very few cases. The laws of locality thus become informatory as to disease. If, for instance, every house in a township could give the history of every case of disease that has occurred in it the last fifty years, and one skilled in etiology and classification could handle the data, he would come to know what significance to give to cases and learn from them to unriddle causes far better if he can be a living witness and investigator, and so have sources for comparing and correcting observations. Thus, not only the records of death, but of disease and the personal experience of local practitioners is secured

A map can be had by each president or reporter of a county or city society, as the property of the society, in order that views may be compared. A physician, who has lived and practiced many years in one locality and whose note-books can remind him with exactness of cases and circumstances, has really very much information as to climatic or other local causes which he can give and which ought not to die with him.

Short notes, made at the end of each month as to its characteristics and diseases and summed up the end of each year, would aid much in the final summary. So soon as a full list of observers is secured, a very brief yearly report will be asked, so as to assure a full return at the end of the period. For the small expense incurred in correspondence, it is hoped provision will be made. As localities and the methods of individual observers are so diverse, no precise form will be given unless asked for. The design is rather to get the mature judgment of the observer, formed in his own way, except that it should depend upon the careful study and analysis of closely-noted facts and be formed on expert and continued investigations and reflections. It should be the observation of precise methods rather than the promiscuous methods of unskilled observers. We hope by the time of the semi-decennial census to be able to get a sufficient number of data to give valuable guidance. The effort is to get in connection with vital returns, the personal testimony of some competent observer. That experience is most valuable, which, either by statistical or other methods, classifies knowledge, and so has breadth of view and system of analysis in making conclusions.

When the physicians of any locality come to study accurately the deaths of each year, the diseases of each year, to compare vital statistics with their own observations, when they acquire the habit of being observers on a system to such a degree that their conclusions are arrived at not as hasty generalizations or from a few recent cases, but as the record of an analyzed experience, we always secure most valuable facts as to public health and the prevention of disease. Carefully collected statistics and carefully collated experience are the two factors of information upon which the State care of the health of the population must rely. We therefore ask societies and individuals to aid in this work, and all the more, because it is not less vital to the progress and success of medical science and art than it is to social and sanitary progress. Any physician, who thus on a system files away his observations each three or six months, will have no difficulty at

the close of each year, or at longer periods, in furnishing valuable data as to the diseases of his locality and suspected impairments to the general health.

By order of the Board.

Trenton, Feb. 15th, 1882.

EZRA M. HUNT, M. D.,
Secretary.

SLIPS SENT HEREWITH.

TRENTON, April, 1882.

To the County Medical Reporter:

DEAR SIR:—Inclosed please find circulars, and one of each please mail, with a postal inclosed, in a circular envelope, to such person in each city or part thereof, and in each township of your county, as you may choose, to aid in this work. Write your own name in one corner on the outside of the envelope. On hearing from them, I will send map and inform you.

Respectfully,
E. M. HUNT,
Secretary.

To Local Health Reporter:

DEAR SIR:—In accordance with the circular herewith inclosed, we have appointed a physician of your county to have oversight of the work proposed. It is his and our desire to have you act as a reporter to, or occasional correspondent with him in furthering the objects of this inquiry. If you will favor us by so doing, a map will be sent you and arrangements be made for the small expense of correspondence. Be pleased to reply by postal to State Board of Health, Trenton, at your earliest convenience. If for any reason you cannot serve, please give the name and address of the physician whom you would recommend.

E. M. HUNT,
Secretary.

CIRCULAR XXXI.

Circular as to Petroleum, Kerosene, etc.

The Legislature of New Jersey, at its last session, passed a law in reference to the use of "petroleum or coal oil for lighting and illuminating purposes," (see ch. 168, Laws of 1882.) In the Second Report

of the Board of Health (1878,) pages 16–22, and the Fourth Report, (1880,) pages 25–28, and the Fifth Report, pages 22 and 106, the need of legislation upon the subject is illustrated. These are but items in the records of destruction of human life which has occurred from a substance which is safe and valuable for lighting purposes, if properly prepared. A careful estimate has placed the number of deaths from kerosene in the United States as high as 6000 in a single year. Fire and destruction of property often result. The law which has been passed is the extreme limit of leniency, and its value depends on its rigid enforcement. We have the assurance of the co-operation of many of the manufacturers, and only need the aid of local Health Boards and retail dealers to make it fully operative.

It will be the duty of all local Boards of Health to see to it that the people in their respective districts are protected in the manner and to the degree which the law provides. Besides the notice given by the State Board of Health and in the newspapers, it will be wise for local Boards to send copies of this circular, which can be had on application by postal to us, to all venders of or dealers in illuminating oil in their respective districts.

Section first of the act holds all dealers responsible that the oil which they are selling for household illuminating purposes, shall be proper for use as certified by the test and method of testing herewith adopted. Any person who can prove that he has bought oil of a less grade "for inside light" may bring suit. Sections fourth and fifth give, in addition, the power to those named therein to enter and procure the oil for the special purpose of test. In such cases the vender "*may* be enjoined and prohibited" by special notice, but this does not prevent action without notice by those who have purchased for actual use for lighting purposes. Purchasers of oils to be sold in this State, should have the guaranty that the oils purchased are such as will answer the test herein given, and should not, when purchasing from refiners outside the State, rely upon the brand, but ask the written guaranty of the dealer.

If imperfect oils are brought into this State, not in accord with this law, we shall do all in our power, by exposure and prohibition of sale, to expose this wrong against human life.

The following are the means of ascertaining whether or not petroleum or kerosene to be sold for lighting or illuminating purposes, is of the character required by the act; and as such, is hereby declared

by the Board of Health of this State, together with the Council of Analysts appointed by it, to be the means of determination.

"Saybolt's Electric Tester" shall be used both for determining the fire test and the flash test as indicated by section three of the act, (see ch. 168, Laws of 1882.) And the instrument shall be operated in accordance with the instructions for using the "Saybolt Tester," adopted by the New York Produce Exchange, which took effect August 1st, 1879, but with this difference: that for oil of 110° fire test and upwards the oil shall (after the first flash) be flashed at 95, 100, 104, 108, 110, 113, 115.

We give the following modified instructions for using the Saybolt Electric Tester for ascertaining the flash and fire test of petroleum and kerosene; and as adopted by the State Board of Health and the Council of Analysts of New Jersey.

DIRECTIONS FOR USING THE ELECTRIC TESTER.

Fill the metal bath with water, leaving room for displacement by the glass cup.

Heat the water until the bath thermometer indicates 100° Fahrenheit, at which point remove the lamp.

Fill the glass cup with oil to top line, indicated by the rim surrounding cup, which is one-eighth of an inch below top edge of the cup.

See that there is no oil on the outside of the cup, nor upon the upper level edge, using paper to clean cup in preference to cotton or woolen material.

See that the surface of the oil is free from air bubbles before first flash is produced.

Lift the cup steadily with left hand and place in the bath.

Suspend the thermometer with the bulb of same immersed just from view under surface of oil.

Adjust the flashing bar, with the stamped side of the bar facing the operator, immerse the battery zincs in fluid, and when so immersed during the operation they should not come in contact with the carbon plates.

Try for first flash every degree until the same is obtained.

Attain flash by producing spark with one stroke of the key.

The stroke on the key should be such as in telegraphy is used to produce what is called a dot, that is, a short quick stroke.

When the thermometer in the oil indicates 90°, introduce lamp under the bath, and do not remove it until the operation is finished.

The temperature of oil when placed in bath, should not be lower than 55° nor higher than 70° Fahrenheit.

The flashing bar must be free from oil before adjusting for tests.

Drafts of air must be excluded from the apartment wherein tests are made.

Oil of 110° and upwards, shall (after first flash) be flashed at 95, 100, 104, 108, 110, 113, 115.

Oil of 120° and upwards, after first flash, 100, 105, 110, 115, 118, 120, 122, 125.

Oil of 130° and upwards, every five degrees after first flash until burning point.

The strength of the battery should be regulated by the zincs to produce just sufficient power to obtain continuous sparks.

The vibrator at the left-hand side of the induction coil is adjusted by means of a set-screw, and should be set so that a continuous spark is the result when the battery is working. Further details can be had of the manufacturers, 62 Beaver St., New York City.

An oil which flashes at 113° *without taking fire is to be regarded, in accordance with these instructions, as having stood a burning test at least as high as* 115°*; it may have stood a higher one.* In general, the fire test of the oil is the degree whose number (in these directions) next follows the degree at which the last flash without ignition of the oil itself took place.

Thus, for oil of 120° and upwards, if the flash at 118° was not followed by ignition of the oil, while the flash at 120° set fire to the oil, the oil would be regarded as having attained a fire test of 120°.

In case of any accident occurring from the *actual explosion* of any lamp or can containing oil, the Local Board of Health should at once procure specimen and evidence as to its source and have the same tested by some competent chemist. Even where accident has resulted from the improper use of oil, as in lighting fires, the rapid explosion has resulted from gas present in the can or the intense inflammability of the oil.

All cities should employ a local inspector, who, if need be, can be duly authenticated by this Board. Besides the oversight of local Boards, we shall use proper methods for discovering the qualities of kerosene offered in the market and the sources from whence it comes.

It is to the interest of all that a safe kerosene be used. Heretofore the production of a poor article has made an unfair competition, which it is hoped to overcome, since life and health are endangered and fair dealing is prejudiced thereby. The following is that portion of the law which relates to the qualities of oils and the penalties:

"An act to regulate the sale of petroleum and its products.

"1. *Be it enacted by the Senate and General Assembly of the State of New Jersey*, That hereafter petroleum, or any of the products thereof, may only be sold for use in this State under the following regulations and restrictions, viz.: (*a*) benzole, gasoline, naptha and benzine must be sold under their true names respectively, and such names must be plainly shown upon the barrel, can or vessel in which the same are sold or offered or exposed for sale respectively, or upon a label securely fastened thereto; (*b*) petroleum or kerosene which will inflame at a less temperature than one hundred and fifteen degrees Fahrenheit, fire test, or flash at a less temperature than one hundred degrees Fahrenheit, flash test, must have plainly designated upon the barrel, can or vessel in which the same is sold or offered or exposed for sale, or on a label securely fastened thereto, the number of degrees Fahrenheit fire test below which the same will not inflame; (*c*) only such product of petroleum as will not flash at a less temperature, or flash test, than one hundred degrees Fahrenheit, or such as will not inflame at a less temperature than one hundred and fifteen degrees Fahrenheit, may be sold for lighting or illuminating purposes, except where the same is to be used in street-lamps or open-air receptacles, or in gas machines, in which case (as to petroleum or kerosene) there shall be plainly marked on the barrel, can or vessel in which the same is sold or offered or exposed for sale, or on a label securely fastened thereto, the words 'not for inside light;' provided, that this act shall not apply to petroleum or its products sold in tanks used for transportation.

"2. *And be it enacted*, That if any person shall sell or offer or expose for sale, for use within this State, except in the manner permitted by this act, any petroleum or product thereof, he shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or imprisonment at hard labor or otherwise for a term not exceeding one year, or both; and any sale in quantity less than one barrel shall be presumed to be for use within this State."

The law goes into effect July 1st, 1882. The notices thereof, as

required, have been given in the circular of April 20th, and the county notice of June 20th, 1882.

By order of the Board.

Trenton, June 20th, 1882.

EZRA M. HUNT,
Secretary.

CIRCULAR XXXII.

To Local Boards of Health of Cities and Townships.

The importance of a care of the public health on the part of local authorities is now generally recognized in this State. The value of a local Board consists in its readiness to meet sudden perils to the public health; to prevent nuisances or abate those which exist; in its ability to impart information, and its power to enforce laws where other methods fail. "The Circular to Local Boards of Health" and the "Suggestions to Boards of Health and References to Sanitary Laws," to be found in the Fifth Report (1881,) pages 181–188, should be carefully noticed by all Health Boards. In addition, important legislation has been added to that of previous years. We herewith send a printed slip of a law just passed as to local Boards. It extends and fully corrects all defects of power in such Boards of Health as have been organized under the laws of 1880 and 1881. (See ch. 155, Laws of 1880; ch. 135, Laws of 1881.) It applies to all townships and to all cities that had not special Health Boards under their charters previous to 1880, and by the law of 1881 may be adopted by these. Some have already adopted it, and the three or four that remain should do so without delay.

It can now be claimed that in most respects sufficient provision has been made for the efficiency of local Boards so far as they can or ought to be empowered by law. It is to be borne in mind that under common law, as well as under these special provisions, there is remedy for many nuisances hazardous to the public health. These Boards, both by virtue of their own powers and by virtue of other rights accorded for the protection of health, ought to be able, when necessary, to control or abate flagrant evils, and to do very much in preventing the causes of disease. In all cities and towns there should be regular

meetings of the Boards; and in all townships at all regular meetings of the township committee, they should recognize this as a part of their service. The work appropriate to local Boards is already outlined in the circulars of this Board, to be found on pages 184–187 and page 207 of the Fifth Report. In addition, there are circumstances which often give special importance to the consideration of prominent local evils. Each Board should realize that it has as much to do in preventing evils, and in instructing the people how to avoid nuisances, as in abating existing nuisances.

In securing a more perfect return of marriages, births and deaths it can be of essential aid to the city clerks and assessors. We must know the ages and conditions of population in order to study the significance of death rates. Besides, it is the legal right of each person to have such record made. Hereafter neglect must lead to stringent action on the part of local Boards and of the State Board.

The new milk bill which has been passed can be made of great service as a protection to the health of children and invalids.

The new law as to illuminating oils makes it a misdemeanor to sell any dangerous oil. Local Boards should be watchful over this evil, and report any infringements.

The bill as to adulteration of food is also in full force.

All cases of contagious diseases of animals need to be carefully watched, and report made to this Board if necessary. In cities more care should be exercised as to the keeping of animals and as to nuisances arising therefrom.

If, hereafter, any local Board fails to recognize the care of the public health and the prevention of insanitary conditions as a part of its duty, the fault will not be with the laws of this State. There will be no lack of earnest co-operation on the part of the State Board. We ask that the reports and circulars of the Board be carefully studied, and that in all other respects you will feel both the duty and the privilege of aiding in the securement of health and the prevention of the avoidable causes of disease.

E. M. HUNT,
Secretary.

P. S. If in any township, there is no Board of Health as required by law, the assessor will, on receipt of this, please send us postal containing name and P. O. address of the members of the township committee.

Trenton, April 1st, 1882.

CIRCULAR XXXIII.

Circular to Local Boards of Health as sent out with Annual Blanks.

All local Boards of Health need to make their annual return to the State Board of Health during the month of October.

All Boards which were constituted under the law of 1880-1881 are permanently in existence. The law of itself constitutes the township committee, the assessor and the township physician, if there be such an officer, as the Board of Health for each township; and also provides as to Boards of Health in cities.

In some cases, complaint is made that local Boards do not seem to know their precise duties under the law. The general law is to be found ch. 155 of the Laws of 1880.

On pages 272–282 of the Fourth Report of the Board (1880) is an explanatory circular as to the law and the duties of Health Boards. Pages 184–188 of the Fifth Report (1881) have further directions and references. If, in any instance, any Board has failed this year to consider the health matters of its town or township, it should at once be called together. It is satisfactory to know that most of the Boards realize the importance of this oversight of the public health. Some, however, take it for granted that no avoidable causes of disease exist, and, by their unintentional negligence, add to the sickness and deaths of their locality.

We ask each assessor or town clerk to state to us any failure on the part of the local Boards.

Blanks are furnished similar to those of last year. (See Fourth Report, 1880, page 281.)

A list of Boards which have reported is to be found on pages 119–179 of the Fourth Report (1880), and pages 123–165 of the Fifth Report (1881.)

Boards which have reported heretofore will not need to report the items in the schedule under A, B, E, F, G, I, L, M, N, O, P, Q this year, unless some special new fact exists.

Under C, we ask full statements as to the sources and conditions of water-supply; as to objections made to it; as to any asserted or proven sickness or deterioration of the general health resulting therefrom; also, what plans of remedy are used? also, if cisterns or driven wells are used and found satisfactory? also, if filters, and if

so, what kind are relied upon? Has the lowness of the streams and wells the last three months seemed to affect the quality of the water-supply?

Under D, we inquire as to any natural or artificial defects in drainage and as to any sickness attributed thereto by physicians. How has the amount of malarial fever, so called, compared with that of last year? Are there any serious interferences with natural water-courses? Has the State law as to drainage or the special one in addition as to the drainage of cities been applied to any case in your section?

Under D, as to sewerage, specify what town or parts of towns have sewers, with their size, construction, material, etc. Has the town a sanitary map, showing its underground structures, its contour, etc.? To what extent are brooks or streams made to carry sewage matter and have any evil results been felt?

Under H, report the situation of water-closets in relation to water-supply and the modes of disposal of excreta, of refuse and of slop-water. Also, cases in which inside water-closets or slop or kitchen sinks are connected with the outside privy-vault or with cesspools. Also, as to the common mode of emptying privy-vaults and cesspools.

Under J, give particulars as to diseases of animals; especially those regarded as contagious.

Under K, state whether slaughter-houses and abattoirs are situated near to private houses.

Under L, state what trades or factories cause a nuisance, and whether by smoke or refuse.

Under R, report any sanitary improvements of the past year and any in contemplation.

Under T, state any known causes of the spread of disease or any neglect of vaccination.

Under W, add a general report as to prevalent diseases from July 1st, 1881, to July 1st, 1882, and make a separate noting as to any especial sickness from July 1st, 1882, to this date.

Assessors and town clerks, in addition, should personally report, as is their duty, any neglect in returns of vital statistics, and by whom; since the records of the last three years already show how important is exact knowledge as to the marriages, births, deaths and causes of death in each division of the State. Many other matters of importance will no doubt occur to local Boards, on which report should be made.

We should be glad to have brought to our notice any alleged defects in existing laws. Except that defects of close study of the laws and of judicious enforcement or administration of law are not to be attributed to the laws themselves.

Indifferent attention to duty, dilatory dealing with undoubted nuisances or promiscuous doubts where legal advice would clearly point out the methods, are not to be taken as defects of law. It is found that the calm judgment of courts and juries is against nuisances prejudicial to the public health; that present laws are applicable to such nuisances, and that where reason and persuasion will not avail, the execution of sanitary law has as good a chance of being sustained as has any other form of necessary litigation.

Note especially the law, ch. 155, Laws of 1882, which corrects some defects in former laws.

Let town clerks and assessors see to it that all circulars sent them are read before the Board of Health or township committee, and copies fastened in the Health Book.

By order of the Board.

Trenton, October 1st, 1882.

E. M. HUNT,
Secretary.

CIRCULAR XXXIV.

As to Vital Statistics.

[See page 255.]

CIRCULAR XXXV.

General Circular as to Duties under the Laws Relating to Vital Records and Statistics.

TO CLERGYMEN, JUSTICES OF THE PEACE, ETC.

It is not only a breach of law, subjecting you to penalty, but a risk to the personal rights of individuals, to neglect the return, within thirty days, of a marriage certificate to the assessor of the township or city clerk of the city in which the event occurs. Blank forms can be had of the assessor or city clerk, or through postal addressed: Bureau of Vital Statistics, Trenton, N. J.

TO PHYSICIANS, ETC.

Returns of births are not only required by law, but essential to that right of record which is thus secured to every child. Birth rates and death rates need to be compared in order to know sanitary conditions. The returns to assessor or city clerk, must be made each month. Your promptness will greatly aid us in comparisons. Blanks can always be had of assessors or city clerks, or through postal addressed: Bureau of Vital Statistics, State House, Trenton; or a small handbook when preferred.

N. B.—See law that physicians must have their diplomas on record in office of county clerk.

TO UNDERTAKERS.

You are aware that the *burial* of any person by you without a permit is contrary to law. A failure to find the record often obscures legal claims, and may subject you hereafter to great risks. Where the *death and burial* are in a township outside of city limits, the certificate of death answers as a permit. Delay to obtain the certificate until after death, and burial without a permit must not occur. Assessors, clerks and local Boards of Health must report any negligence to Bureau of Vital Statistics, Trenton, N. J. Keepers of cemeteries and churchyards must see certificate of death or permit.

City clerks will please note ch. 81, page 119, section 4, Laws of 1879.

TO CITY CLERKS AND ASSESSORS.

This bureau has sent notices, to secure prompt returns, to all physicians, clergymen and undertakers. Under the law, any negligence, with the name and address, must be reported to us. Ch. 155, page 207, Laws of 1880, gives full power, also, to local Boards. These returns are essential as records, and for the study of local evils, and of the means to protect the life, health and welfare of our population. The full success of some cities and townships shows that local defects in returns are not the fault of the law, but result from negligence or want of judicious oversight.

Order blanks of Bureau of Vital Statistics, Trenton, N. J., *before* you are out, so that none may complain.

CIRCULAR XXXVI.

STATE OF NEW JERSEY.

Department of State and Bureau of Vital Statistics.

The necessity of a State record of every marriage, birth and death, the legal rights of those concerned, and the penalties for neglect of returns are such that omission to obey the law may at any time cause you both difficulty and expense. We shall hereafter take it for granted that all know the law. Returns should be made in ink and care used as to dates. All city clerks and assessors can, at any time, supply blanks or any needed information, or a postal directed "Bureau of Vital Statistice, Trenton, N. J.," will bring reply.

Trenton, January, 1883.

By order of

HENRY C. KELSEY,

Secretary of State.

CIRCULAR XXXVII.

As to Exhibition of Sanitary, Household and Ornamental Articles and Appliances.

In the practical application of sanitary science, it has become necessary to use very many appliances, both for convenience and to guard against evils incident to household and city life. These inventions have become far more numerous and useful than is generally known. To afford the people a better opportunity to become acquainted with their merits, both by personal examination and by the opinion of experts, the Agricultural Society of New Jersey, the State Board of Health and various sanitarians throughout the State have united to produce an exhibition of sanitary appliances.

Although the first of the kind attempted in this country, it has been so highly successful the past three years as to have led them to make it a prominent feature at this great annual gathering of our citizens. This fair is held for a week each year, only a few miles from New York City, at Waverley, near Newark, on the direct route to Philadelphia and the South and West. Many thousands of visitors from this and other States every year examine this display, and it

affords the best opportunity for familiarizing the people with valuable improvements.

It opens this year on September 18th. A special building for the sanitary department, supplied with water, is provided, and the actual working of house systems, ventilators and various other appliances can be shown. It is intended to make this exhibit an attraction at our annual fairs, so that all may become acquainted with the best sanitary arrangements and inventions, and dealers have a good opportunity for comparing and testing apparatus. When necessary, the judges will order trial, and postpone award until satisfied. Articles of any class may be sent either as competing for premium or for exhibit. Every article should bear a descriptive label, containing detailed information respecting its construction, use, wholesale and retail price; they must also bear the name of the owner or agency exhibiting.

MUSEUM.

The State Board of Health has commenced at Trenton, the capital of the State, a museum of sanitary appliances, to which any owner or manufacturer may present the articles exhibited as the property of the State, for permanent examination and exhibit. Specimens of all new sanitary inventions are solicited and may be sent care of E. M. Hunt, M. D., Trenton, N. J.

The following is an abbreviated summary of leading articles that are classed in sanitary department of fair; various other articles will properly come in this department and be subject to award.

DEPARTMENT L.

SANITARY AND MEDICAL, HOUSEHOLD AND ORNAMENTAL.

Class 43—*Domestic and Hospital Architecture, Planning, Construction and Decorative Material.*

	PRIZE.
Planning, Construction, Ornamental and Decorative Material.	Diploma.
Wall Paper, Window Blinds, Carpets.	Medal.
Samples of Building Stone, Concrete or other Building Material.	Diploma.
Pipes, Tile, Sanitary Pottery, &c.	Medal.

Class 44—*Ventilation, Lighting and Warming.*

	PRIZE.
Warming Houses by Flues, Steam or Hot Water—best system of each.	Medal.
Steam and Gas Cooking Apparatus.	Medal.
Stoves for Heating or Cooking, so as to avoid gas and dust.	Medal.
Chimney Cowls and Caps.	Diploma.
Specimen Ventilators of all kinds.	Diploma.
Oil, Gas, Electric and other Lighting Materials and Fixtures.	Diploma.

Class 45—*Drainage, Water-Supply, Specimens of Soil, &c.*

Drainage Plans and Sanitary Maps.	Diploma.
Specimens of Soil and Organic Matter, from New Jersey Experimental Station.	Medal.
Water-Supply Apparatus, as Cisterns, Flush Tanks, Filters, Refrigerators, Sinks, &c.	Medal.

Class 46—*Bathing Apparatus and Plumbers' Supplies.*

Bath Tubs and Connections.	Diploma.
Best Water Traps and Grease Traps.	Medal.
Dry Earth Closets.	Medal.
Best Pan, Hopper and Plunger Water-Closet.	Medal.
General Assortment of Plumbers' Work and Materials.	Diploma.

Class 47—*Druggists' Supplies and Sundries, Foods, Medical and Surgical Instruments, Appliances used in Teaching.*

Pure and Adulterated Drugs, Disinfectants, Deodorizers, Mineral Waters, Yeast Powders, Dietetic, Preserved, Condensed, Babies' and Adulterated Foods.
Galvanic and Magnetic Instruments.
Appliances used in Teaching and School-room Furniture.
Obstetric Instruments.
Ophthalmic "
Dental " and Work.
Aural "
For selection of each article in class, Silver Medal, Medal or Diploma.

Class 48—*Sanitary Apparatus, Best Modes of Destroying and Preserving Animals, Improvements in Preparing Food.*

	PRIZE.
Excavating and Odorless Apparatus.	Medal.
Best Means of Removing Vermin.	Diploma.
Models for Care and Protection of all Living Creatures.	Medal.
Best Mode of Destroying Animals for Food.	Diploma.
Improvements in Mode of Cooking Food for Men and Animals.	Medal.

Other exhibits of Sanitary Appliances may have Medal or Diploma as award.

Class 49—*Apparatus for Developing Strength and Saving Life, Machinery for Saving Labor, Appliances and Apparatus for the Sick and Wounded.*

Life Saving Apparatus, Fire Escapes and Extinguishers.	Medal.
Life Boats, Preservers and Life Rescue Apparatus.	Medal.
Ambulances, Invalid Chairs, Beds, Mattresses and other conveniences for the use of the Sick and Wounded.	Medal.
Hygienic Clothing.	Diploma.
Health Lifts, Gymnasium Apparatus and Improvements in Labor-Saving Machines.	Diploma.

NOTE.—In 1884, a National Exhibit will be held in Washington, D. C.

Trenton, N. J., July 1st, 1882.

REFERENCES TO CIRCULARS OF THE STATE BOARD OF HEALTH.

Circular I., Third Report, 1879, page 158. Explanation of parts of the acts as to marriage, birth and death returns. (See also Circular XXIV.)

Circular II., Third Report, 1879, page 163. As to assessors, town clerks, etc.

Circular III., Third Report, 1879, page 167. As to vital statistics.

Circular IV., Third Report, 1879, page 168. As to town clerks and assessors.

Circular V., Third Report, 1879, page 169. As to sanitary organization of cities.

Circular VI., Third Report, 1879, page 224. As to sanitary appliances.

Circular VII., Fourth Report, 1880, page 255. As to protection to bathers.

Circular VIII., Fourth Report, 1880, page 260. As to householders, city authorities, Board of Health, etc.

Circular IX., Fourth Report, 1880, page 265. As to sanitary appliances.

Circular X., Fourth Report, 1880, page 272. Circular explanatory of recent laws.

Circular XI., Fourth Report, 1880, page 281. As to local boards and as to yearly reports with schedule annexed.

Circular XII., Fourth Report, 1880, page 282. As to law regulating the practice of medicine and surgery.

Circular XIII., (*a.*) Fourth Report, 1880, page 287. To farmers and dealers in stock.

Circular XIV., (*b.*) Fourth Report, 1880, page 291. As to contagious diseases of animals.

Circular XV., (*c.*) Fourth Report, 1880, page 293. As to contagious diseases of animals.

Circular XVI., (*a.*) Fourth Report, 1880, page 297. As to milk supply.

Circular XVII., Fourth Report, 1880, page 300. To local Boards as to vital statistics.

Circular XVIII., Fourth Report, 1880, page 301, as to small-pox (I.)

Circular XIX., Fourth Report, 1880, page 305. Schedules for institutional sanitary inquiry.

Circular XX., Fifth Report, 1881, page 178. As to small-pox (II.)

Circular XXI., Fifth Report, 1881, page 181. As to duties of local Boards under new laws.

Circular XXI., Fifth Report, 1881, page 184. Suggestions to local Boards of Health as to their duties.

Circular XXII., Fifth Report, 1881, page 188. As to exhibit of sanitary and household appliances.

Circular XXIII., Fifth Report, 1881, page 191. To local Boards as to yearly reports.

Circular XXIV., (*d.*) Fifth Report, 1881, page 193. As to contagious diseases of animals and law.

Circular XXV., (*e.*) Fifth Report, 1881, page 197. As to contagious diseases of animals.

Circular XXVI., (*f.*) Sixth Report, 1882, page 213. As to contagious diseases of animals.

Circular XXVII., Sixth Report, 1882, page 220. As to sanitary instruction and training in schools.

Circular XXVIII., Sixth Report, 1882, page 222. Sanitary school circular of the New Jersey Board of Health.

Circular XXIX., Sixth Report, 1882, page 233. As to charitable and penal institutions with accompanying slips.

Circular XXX. Sixth Report, 1882, page 236. As to sanitary survey, topography, etc.

Circular XXXI., Sixth Report, 1882, page 239. As to petroleum, kerosene, etc.

Circular XXXII., Sixth Report, 1882, page 244. To local Boards of Health of cities and townships.

Circular XXXIII., Sixth Report, 1882, page 246. To local Boards of Health.

Circular XXXIV. (Just re-printed and ready on call by postal and in next report.) As to vital statistics. To assessors, Boards of Health, clergymen, coroners, physicians, midwives, undertakers, etc.

N. B.—*This Circular may be referred to* on page 158, etc., of Third Report, 1879, where are also other circulars relating to vital returns. This and the two following circulars can be had for postal by all assessors, city clerks, or any whose duty it is under the law to make returns.

Circular XXXV. Sixth Report, 1882, page 248. As to vital records.

Circular XXXVI. Sixth Report, 1882, page 250. As to vital records.

Circular XXXVII. Sixth Report, 1882, page 250. As to exhibit of sanitary appliances.

REFERENCES TO LAWS RELATING TO THE INTERESTS OF PUBLIC HEALTH.

On page 143 of First Report, 1877, will be found a list of references to former laws bearing on public health.

As the scope and duties of the Board have since been extended

there should be added to this list as found in the *Revision of the Statutes of New Jersey*, 1709–1877, as follows:

I. "An act relating to the transportation of explosive and dangerous material." Approved March 17th, 1874. Page 263.

II. "An act to prevent the willful pollution of the waters of any of the creeks, ponds, or brooks of this State." Approved April 21st, 1876. Page 1297.

III. "An act to prevent the deposit of mud, earth, soil, ashes or refuse on the New Jersey shore of the Hudson river." Approved March 9th, 1877. Page 1297.

IV. "An act for the incorporation of societies for the prevention of cruelty to children." Approved April 15th, 1876. Page 1344.

V. "A further supplement to an act entitled an act to provide for the drainage of lands." Approved March 8th, 1872. Approved March 8th, 1877. Page 1352.

VI. "An act for the construction, maintainance and operation of water-works for the purpose of supplying cities, towns and villages of this State with water." Approved April 21st, 1876. Page 1365. (See also Chapter CLXXXII., Laws of 1880.)

VII. Supplement. Approved March 7th, 1877. Page 1368.

VIII. "An act to prevent the spread of glanders among horses." Approved March 31st, 1864. Page 24.

IX. "Protection against mad dogs." Approved March 28th, 1862. Page 25.

Additional Laws to be Found in the "Laws of New Jersey" since the Revised Statutes, 1709–1877.

1878.

I. "An act to provide for sewerage and drainage by incorporated camp meeting associations or seaside resorts." Chapter XL., page 65. (See, also, Chapter CLVII., Laws of 1880, etc.)

II. "An act to provide for the assessment and payment of the cost and expenses incurred in constructing sewers and making other improvements in townships and villages." Chapter LIX., page 70.

III. "An act relating to municipal or other authorities owning or managing works for the supplying of water to the public." Chapter LXX., page 92.

IV. "An act to prevent the pollution of the waters of any of the creeks, ponds or brooks of this State." Chapter CXL., page 211.

VIII. "An act for the formation of borough governments in sea-side resorts." Chapter CLVI., page 232. (See page 237.)

IX. "An act for the protection of dairymen and to prevent deception in sales of butter." Chapter CCIII., page 317.

X. "An act concerning the registry and returns of marriages, births and deaths." Chapter CCXXXIX., page 355, (amended.)

XI. "An act for the formation of borough governments." Chapter CCLX., page 403.

LAWS OF 1879.

I. A supplement to an act entitled "An act concerning the registry and returns of marriages, births and deaths." Approved April 5th, 1878. Chapter LXXI., page 117.

II. A supplement to an act entitled "An act to enable cities to supply the inhabitants thereof with pure and wholesome water." Approved April 21st, 1876. Chapter LXXXVI., page 168.

III. "An act for the improvement of the sanitary condition of cities." Chapter CLXXI., page 276. (Applies only to Hudson county.)

IV. A supplement to an act entitled "An act to provide for the assessment and payment of the costs and expenses incurred in constructing sewers and making other improvements in townships and villages." Approved March 12th, 1878. Chapter CLXXV., page 287.

LAWS OF 1880.

I. A supplement to an act entitled "An act to prevent the willful pollution of the waters of any of the creeks, ponds or brooks of the State." Chapter LII., page 61.

II. "An act respecting sewerage and drainage." Chapter LVI., page 69.

III. An act entitled "An act concerning the protection of the public health and the record of vital facts and statistics relating thereto." Chapter CLV., page 206.

IV. "An act for incorporation of companies for draining and improving meadows and lands overflowed by tide-water." Chapter CLXIII., page 240.

V. "An act to render more effective the ordinances of county Boards of Health and vital statistics in the several counties of this

State and to define their powers and duties." Chapter CLXXXVII., page 279. (Applies only to Hudson county.)

VI. "An act to regulate the practice of medicine and surgery." Chapter CXCIX., page 296. (See also Chapter XLIX., page 52, Laws of 1881.)

VII. A supplement to an act entitled "An act to establish a State Board of Health." Approved March 9th, 1877. Chapter CCXX., page 322. (Refers to animals.)

LAWS OF 1881.

I. "An act to authorize municipal corporations to contract for a supply of water for public uses." Chapter CIV., page 118, Laws of 1881.

II. "An act relating to local Boards of Health." Chapter CXXV., page 160.

III. A further supplement to an entitled "A supplement to an act entitled 'An act to establish a State Board of Health.'" Chapter CLIV., page 190. (Relates to animals.)

IV. "An act to provide for drainage where the same is necessary to the public health." Chapter CLVIII., page 195.

V. "An act to authorize the abatement of nuisances in cities and to make the cost and expense of such abatement a lien upon lands wherein such nuisances exist." Chapter CLIX., page 202.

VI. A supplement to an act intitled "An act for the improvement of the sanitary condition of cities." Approved March 14th, 1879. Chapter CCIX., page 261.

VII. "An act for the improvement of the sanitary condition of counties in this State." Chapter CCX., page 265.

VIII. "An act to prevent the adulteration of foods or drugs." Chapter CCXVII., page 283.

IX. "An act authorizing the construction of sewers or drains in certain cities where necessary to preserve the public health, although the limit of authorized expenditure for public improvements in such cities would thereby be exceeded." Chapter CCXX., page 288.

LAWS OF 1882.

I. A supplement to "An act to prevent the introduction of malignant and other infectious diseases into this State." Approved April 6th, 1871. Chapter XIII., page 17. (Relates to quarantine.)

II. A supplement to an act entitled "An act to provide for the assessment and payment of the costs and expenses incurred in constructing sewers and making other improvements in townships and villages." Approved March 12th, 1878. Chapter XXXIV., page 37.

III. "An act to authorize cities to construct sewers and drains and to provide for the payment of the cost thereof." (See, also, page 235, Laws of 1882.) Chapter L., page 61.

IV. "An act to provide for the licensing and regulating of milk dealers and their agents in cities, incorporated boroughs or police, sanitary and improvement commissions and incorporated camp meeting associations or seaside resorts." Chapter LXXIV., page 87.

V. "An act to prevent the adulteration and to regulate the sale of milk." Chapter LXXXII., page 97.

VI. Supplement to an act entitled "An act to establish a State Board of Health, etc. (Relates to animals.) Chapter C., page 133.

VII. "An act to provide for the better security of life and limb in case of fire in hotels and other buildings." Chapter CX., page 142.

VIII. "An act relating to the improvement of streets and the construction of sewers in the cities of this State." Chapter CXXXV., page 190.

IX. A supplement to an act entitled "An act concerning the protection of the public health and the record of vital facts and statistics relating thereto." Approved March 11th, 1880. Chapter CLV., page 217.

X. "An act for the preservation of the health of female employees." Chapter CLIX., page 227.

XI. A supplement to an act entitled "An act concerning the protection of public health and the record of vital facts and statistics relating thereto." Approved March 11th, 1880. Chapter CLXV., page 233.

XII. "An act to regulate the sale of petroleum and its products." Chapter CLXVIII., page 236.

XIV. "An act to provide for the appointment of commissioners to determine upon plans for the storage of any of the waters of this State for the purpose of furnishing to cities and towns a joint water-supply." Chapter CLXXXIX., page 264.

Beside these references, there are some laws which, without formal repeal, are made obsolete by provisions contained in the laws enumer-

ated. There are also in many general laws, charters, etc., provisions which bear more or less directly on the health of the people and its preservation. As a rule, such laws as have not their execution especially provided for are inoperative, although, sometimes, (see chapter LIX., page 227, 1882, as a specimen,) they hold up a desirable model. Some are local in their application although made general in order to answer constitutional requirements. For all cities, the careful preparation and publication of ordinances to conform to laws is important, and not infrequently for townships, also. Until precedents under recent laws are fully established, Boards should be sure to act where action is necessary, but should clearly ascertain the various legal modes of dealing with conditions hazardous to the public health, and under skilled advice choose the method which is most likely to be successful. Every local Board in this State has a very important sphere of usefulness, and when they do not succeed by judicious warning, by convincement of offending parties by giving information as to the reality of evils, by moral suasion, or by proper warnings, between the powers of indictment, of injunction and of authorized summary proceeding under sanitary police provisions, they have great legal support.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1881, to July 1st, 1882.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By EZRA M. HUNT, M. D., Sc. D.

Medical Superintendent of State Vital Statistics.

INTRODUCTION TO THE REPORT ON VITAL STATISTICS.

SIGNIFICANCE OF VITAL STATISTICS.

The increasing recognition which is being given to the value and availability of vital statistics, as indicating the essential conditions of population and as directing us to feasible methods of preserving life and promoting the social advantage of the State, has already been noticed in former reports. As legal records bearing on inheritance, on life insurance, on pensions and various rights of property and of life, they have long been valued. As a census of the vital movements of population, they have always been considered indispensable in the record of social statistics. Halley, bringing the science of numbers to bear upon celestial reckonings, was the first to predict the time of the return of a comet. He conceived that life has also its accurate laws, and that a study thereof, by the collection of facts, could as well determine as to health, disease and longevity. He and others have taught how errors which would affect small numbers, are eliminated, when, by a law, we come to reckon as to tens and hundreds of thousands of people. So he proposed the life tables which are now so much a basis in life insurance. The three great events of birth, marriage and death each have their ascertained laws, which not only affect, but determine the welfare of States and nations.

MARRIAGE.

Statistics as related to marriage fulfil most important objects. First of all, in a legal point of view, it is recognized that a relationship so important and so affecting the rights of property must at the time of its occurrence have such certification and record as to place the proof thereof beyond doubt. Questions of age, of relationship, and of the transfer of great material interests must ever claim a careful and authentic registry. Law concerns itself with more than this. It

defines degrees of relationship, because the welfare of the State is concerned in consanguinity. It specifies the ages of subjection to parental consent, because up to a certain time it must hold fast to the doctrine of parental control as a State interest. It designates the persons or societies who have authority to perform or authenticate marriage, because clandestine marriage or too great laxity as to the persons by or circumstances under which such union may be made, is destructive of good order and not for the social welfare.

The great interest which the State has in the marriage relation needs to be duly considered. Not the man but the family is the social unit. The State needs to know more about its families than it does about its individuals. One who examines the various laws of the European States bearing on marriage will perceive that they have their start and growth in that State care which is requisite to secure good citizenship. They are not any of them arbitrary interferences with personal choices, but intended to be only such regulation or restraint as is essential to a good constituency for a good government. The requirement of previous announcement, the prohibition of night marriages and many other conditions, were conservative of the State at the time, and are less needed now only because other guards avail. In some of the New England and Western States license or previous notice of marriage is required. Public attention has recently, by a series of well-studied statistics, been directed to some facts as to the decadence of marriage. An able editorial of the past year refers to the harm done by the influences which operate on both sexes to prevent marriage. "We do not say to delay, but to prevent, for the alarming fact is not the numbers who delay to marry, but the numbers who believe they can achieve the ends and the happiness of life better without marriage. * * * The facts of sex are immutable. Since the world began but one method has been discovered to give sex its meaning without surrendering the race to the domination of passion. So fixed are these forces that the statistics of social vice follow in regular sequence the ratios of the married to the unmarried.

A bad state of morals is to be inferred from a low rate of marriage. However pure the considerations may be that hold individuals in both sexes back from wedded life, the result in the end is unfavorable to morals. The man has everything to gain in wedded life, which is implied in his civilization. * * * The woman, if possible, has even more to gain. It removes her from occupations which no regulation that has yet been devised has made safe and wholesome

for her, to another to which she is suited by nature. The large evil which threatens is back of divorce. There is something mandatory as well as permissive in the verdict of human experience, that the best social state is that in which one man lives with one woman as his permanent wife.

It is found to the interest of States to trace the ages at which persons enter wedlock; to compare the marriages of different nationalities; the relationship; the number of children; the effects of different occupations and social circumstances, and thus secure intelligent information as to the most material interest of the State—its population. These facts are to be accumulated and then tabulated, or kept on record ready for tabulation, until by numbers of facts we can perceive the forces, which, for good or evil, are affecting the condition of the people. It is not mere philanthropy or regulative morality, but governmental ethics, that demands this State care of population.

BIRTHS.

The study of the birth-rate of States and of cities as compared with country districts aids much in determining the variation of increase and decrease of population and the causes operating in either direction. However valuable a foreign immigration may be, children born after arrival here, or children of native citizens, are of a better average value to the State. It is even well when a State can present such inducements to its native born as to secure their settlement in it, or can cultivate a State love which is local as well as national in its attachments. With all that is said about the care and cost of large families, it is found that in all well-organized families of the laboring classes the children more than pay for themselves by the age of twenty-one. Indeed, the labor statistics of Massachusetts show the parents to be indebted to them for aid. The birth-rate is affected by discouragements to marriage, by improper practices and by decadence in health, especially that of mothers. While it is often difficult to analyze and state the proportion of limiting causes, even in seeking for them we get the value of a thoughtful consideration on the part of the people, as to the need of fostering parentage and infant life. We hear so much of our increase of population that we forget the small average of our population as compared with our unoccupied acres. A distinguished English statesman recently traveling in this country, when asked what was the greatest drawback to progress he had observed,

replied: "The absence of adequate population." A birth-rate of thirty-three per thousand does not represent a rapid increase. Any other than natural limitations to the birth-rate, or any causes which militate against families, are to be looked upon as evils, not less seriously by the statesman than by the moralist.

DEATHS.

The records of death and the requirements of a certificate before burial, have been found essential in many ways. It is not wise to permit life to be ended without some form of authentication of the cause and of the disposition made of the body. General Graham, as Registar-General of England, says: "Like the institution of the coroner's jury, this inquiry deters from crime, fosters a reverence for human life, and by discovering the causes of premature death in the various circumstances of the population contributes to the progress of the science of medicine, diminishes suffering and leads to the prolongation of life to its natural term." So invaluable have such records been in the study of the causes or occasions of disease that the progress of England in hygiene rests more on this basis than on any other. The government has proceeded on the basis which such statistics have furnished and has succeeded in averting death, in lessening disease and in lengthening life. Not only should the State have its general summary and give information and direction and that uniformity as to methods without which there cannot be adequate comparisons, but the local death-rates, and especially those of cities, need to be carefully watched from week to week and month to month. The sicknesses and deaths among the younger population are often the index of how far parents and older children are being subjected to insanitary conditions that embarrass labor or abbreviate life, even where no speedy sickness or demise follows. Dr. Farr once traced the ages, history, etc., of 100,000 decedents from birth to death, noticing the age at death and the causes. In various forms vital statistics seek thus to trace the life and death history of population. Thus it puts itself in the possession of a knowledge of causes, so as to limit their potency or entirely remove some of them. We refer to articles in our previous reports showing how these laws are to be studied and what are the best ascertained methods of conducting such vital statistics; vital not less to the State in its prosperity and numerical progress, than to persons and to families in health, thrift and happy citizenship.

The number of deaths that occur at the early ages of life is very significant as to the vitality of any particular community. While the number for a single year may depend on some local epidemic, the average through a series of years is a very correct record of the vigor of the population. So the ultimate capacity of a nation can quite accurately be foretold by a close study of its vital statistics through a series of years. Forewarned is forearmed, not less to society than to individuals. Through such records States must study their tendencies to decadence, and so check the progress or interpose compensating influences. It is the misfortune of insanitary conditions not only to kill multitudes at an untimely age, but so to enfeeble or reduce race-vitality as to lower the health standard of those that live. Thus the deaths measure the entailments to the living and to their ancestry.

An accurate knowledge of the relation of the death-rate to local conditions, aids very much in the diagnosis, the treatment and the prevention of illness.

Physicians are now watching, also, more closely the types of disease as they are modified by earth structure, topography, climate or by insanitary conditions in the person. We now fail not so much from deficiency in the aggregate of available and life-preserving knowledge, but in our personal possession of such knowledge, and not less in our ability to enforce what we do know upon the popular mind. We shall never attain perfect correctness of methods, but the two most forward steps thereto are to know what is correct and to obtain so far as State, municipal and other local governments are concerned, a power to execute so far as is feasible. The success which has attended other governments and States in this direction is the guaranty that our efforts in the same direction will be of service.

We are forced to study not only the vital but the social conditions of our population by the light afforded through the study of the forces which affect health and life. It is essential, if in one section of the State the population is dying at the rate of thirty to thirty-five per thousand and in another at only sixteen or seventeen per thousand, that we ascertain the causes of the difference. Especially as so many of these causes are to be found within the reach and duty of control. All the more because the epidemic originated or fostered by private or public filth does not stop amid its degraded beginnings, but invades the homes and the persons of those who have been personally careful. It is for this reason that no health administration is perma-

nently effective which does not secure the numerical statement of marriages, of births and of deaths, in order that it may have them as the record of actual results, as the guides to observation and as the indices of those preventive methods which limit or abate such devitalizing influences as enfeeble, demoralize and destroy the people.

COMPARATIVE FACTS IN CLIMATOLOGY AND GEOLOGY,

As Needed in the Study of Vital Statistics and the Causes of Disease.

BY THE MEDICAL SUPT. OF S. V. S.

In the study of the population of New Jersey, with a view of determining how the health of its inhabitants can be best maintained, we need to know something of its physical geography, its earth structure, its water systems, its atmosphere and its climate. In other words, we need to know its natural locality and its telluric or geological construction, so far as these influence health and life or produce or modify the diseases which occur. It is no longer doubtful that localities differ much in their healthfulness; that we are able to estimate the reasons of difference and often to improve or injure the vital force of the location by structural changes.

We desire here briefly to notice a few of those physical, geological and climatological facts that are of essential import in guiding us in the close local and comparative study of population as related to its locality.

The geological structure of New Jersey is such as to admit of quite distinctive study. As soil or surface depends chiefly upon the character of the formation beneath, we first find out what this is, then how far it has been modified.

Rock or earth structure is spoken of as *primitive* or of the (I.) azoic (eozoic) time or age, when there was no animal life on the earth; as of a transition or (II.) paleozoic time, when life in some forms began to appear; as of a (III.) secondary or mesozoic time, to which, among others, belong the triassic or new red sandstone and the cretaceous formations, and (IV.) the tertiary or cenozoic time, with its tertiary and recent formations.

Now, so distinct are these various formations in this State, that, with the exception of the azoic and paleozoic formations, occurring in the north of the State, they can be and are represented on separate

maps, while the first two, although on one map, are shown quite distinct.

The azoic rocks make up the mountain ranges or Highlands which cross the northwestern part of the State, and which are known by the names of Ramapo, Warwick, Hamburg, Pochuck, Schooley's, Mine, Musconetcong, Scott's, etc. They cover an area of about 772 square miles. The northeastern end of the belt in this State is rough and much of it still in forest. Of the southwestern end a considerable portion is cleared and in good farms. With this exception, it is somewhat sparsely inhabited.

The paleozoic rock is mostly of the silurian variety, composed of sandstones, limestones and slates. These formations occupy many of the valleys between the mountains of azoic rock and the whole of a belt of country 15 to 20 miles wide, northwest of and adjoining these mountains. The rich farming lands of Sussex and Warren counties are on the magnesian limestone, and the grazing and dairying lands are on the slates. The area covered by these formations is about 650 square miles.

The devonian rock, another division of the paleozoic, has a very limited exposure in New Jersey, along the Delaware, from the New York State line to the Walpack bend. The area included is about 40 square miles. There are some valuable limestones and some good soils, but much of it is encumbered with drift. Thus, then, the 772 square miles of azoic rock and the 650 of paleozoic rock are the only two that cannot be on separate maps, and these are thus sufficiently outlined for sanitary study. (For full details see the State geology and subsequent reports and maps.)

The secondary or mesozoic time has two prominent and distinct distributions, viz., the triassic or new red sandstone formation and the cretaceous formation. The triassic or red sandstone formation occupies the belt of country which crosses the State from northeast to southwest and is next southeast of the azoic region. It is about 20 miles wide and extends entirely across from the Hudson to the Delaware. Its area is 1507 square miles. Almost the whole of Bergen, half of Passaic, all of Essex, Union and Hudson, a part of Morris, most of Somerset and Hunterdon and considerable portions of Middlesex and Mercer counties are of it. Its southeast border is nearly on a straight line between Jersey City and Trenton. Its rocks consist of sandstone, shale and trap; the former two of sedimentary and the latter of igneous origin. Generally the shales disintegrate more rapidly than the sand-

stones. These two are characterized by their red color. Their surface is diversified by many abrupt mountain ridges of trap-rock.

The cretaceous formation is found immediately southeast of the red sandstone in a long, narrow strip that reaches from Raritan and Sandy Hook bays to the head of Delaware bay, near Salem. It is 90 miles long and from 12 to 15 wide, and has an area of 1491 square miles. It includes parts of Middlesex, Mercer, Monmouth, Ocean, Burlington, Camden, Gloucester and Salem counties. The white clays occupy the northwestern side of the belt and the green-sand marls the southeastern side.

The tertiary or cenozoic time is almost entirely limited to the southern portion of the State. These formations cover the counties of Atlantic, Cumberland and Cape May, and most of Ocean and Burlington; Camden, Gloucester, and Salem are partly occupied by them, and also a small portion of Monmouth. They consist of sand and clay covered with a thin soil, not very productive. Some of the clay has shells enough to be called marl. Extensive beds of white sand for glass-makers' use are common.

Still more recent formations of the same general character are sometimes known as *Post-Tertiary*. The glacial drift hereafter to be noticed, which covers much of the northern third of the State; the banks of sand gravel which in the form of terraces or level-topped hills, occupy much space in valleys; the alluvial deposits along the borders of streams, and the tide marshes and the sand beaches which border the State along the sea side, and on Delaware bay, are formations which belong to this division.

To this extent a knowledge of earth foundations is necessary in order to an intelligent survey of ground influence upon health; not only does it concern questions as to the level of ground water, and drainage, but the well water is modified, as, for instance, we know in limestone formations. While it is true that topography and forests and various other surface relations have their influence on climate and on constitutions, yet we are not to overlook the relations of the deeper structure. But especially "as soils are formed from rocks, they must necessarily have some qualities in common with the rocks." The usual designations of loamy, clayey, etc., are too indefinite. It is better to base the classification of soils on the geological structure of the particular district, and after to note such modifications as are produced by drift, by washing or by any change, natu-

ral, accidental or artificial, which has been made, and which tends to influence animal or human life.

The classification given by Prof. Cook, the State Geologist, based on geological origin, is as follows:

1. *Granitic.*—The soils on the azoic rocks, and which have evidently been formed from the decomposition or disintegration of the gneiss, hornblende and granite rocks of this formation. They are designated on the map by a crimson or carmine color.

2. *Limestone*—The soils which overlie the crystalline, magnesian, and Helderberg lime-rocks, and have been formed from these rocks by the solution and removal of most of the lime, leaving the earths and impurities of the stone for the soil. Each of these soils and rocks is designated by a blue color.

3. *Slate*—The soils which are on the Hudson river slate, the Oriskany sandstone, and the Cauda-galli grit, and have been formed by the simple disintegration of those rocks. These soils are usually more or less clayey. They are colored on the map of a neutral tint.

4. *Red Sandstone and Shale*—These soils have been formed by the disintegration of the rocks on which they are found. The color on the map shows their location.

5. *Trap*—Is the soil which is formed by the decomposition of trap-rocks, and is found on them. An olive-green color is used on the map to designate this soil.

6. *Clay and Sand*—Designates the soils which are found on the outcrop of the formations of white clays and sands of the lower member of the cretaceous period. These soils are designated by a yellowish color.

7. *Marl Soils*—Are those which are on the outcrops of the clay marls, lower marl bed, red sand, middle marl bed, yellow sand, and upper marl bed. They are marked by the green-sand in them; often sandy. On the map they are colored different shades of green.

8. *Silicious Soils*—Include all those in which quartzose or silicious matter largely predominates. They are designated on the map by a yellow color of different shades, and the following subdivisions are distinguished:

a. Quartz-rock—Soil which is on the conglomerate of the Green Pond mountain, and on the Oneida conglomerate and the Medina sandstone of the Kittatinny mountain. These lands are all in forest.

b. Pine-land—That soil which is found in portions of Southern

New Jersey, and on which *only* yellow pine ever grows. It is formed from the glass-sand and the water-sorted, gravelly earth.

c. Oak-land—That soil which is found in portions of Southeastern New Jersey, and on which oak timber grows. It is the unsorted gravelly earth of the post-tertiary age.

d. Miocene—The soil found on the miocene marl of Cumberland county.

9. *Glacial-drift Soils*—Are found in all the northern part of the State, and north of the Terminal Moraine. These soils are somewhat like the rocks on which they lie, but their composition is changed by the addition of earth brought by the glaciers from the rocks farther north.

10. *Alluvial*—Is the name given to the soils which make the tide marshes—those which are along the borders of the uplands and only a few feet above tide-level, and also to those which make up river flats. They are designated to some extent on the map by fine-ruled black lines.

Some of these soils result from the modification of the original geological soils by deposits of various kinds which can be traced. As these surface beds or admixtures with the natural rock soil affect the soil and the flora, so also there is a modification of sanitary conditions. Sometimes it is in the organic character of the material itself and sometimes it is the change it makes in what would otherwise be the drainage or natural contour. This geology of the surface is, therefore, of much importance in the study of life and of its diseases.

These surface deposits have been referred to under the division of Tertiary or Recent Formations, but as they are still more recent than the Tertiary, geologists often designate them as belonging to a fourth class, known as the Post-Tertiary or Quaternary period. To fully exhibit these, it is only necessary to refer to the valuable article on surface geology marked V (pp. 14–97) in the annual report of the State Geologist for 1880. The effects of the glacial drift with its great terminal moraine and its moraines of recession, the modified glacial drift, the transported glacial drift, and the pre-glacial drift, are there fully outlined and described.

The lake basin of the Great Meadows in the valley of the Pequest; the glacial lakes, such as Green lake, and the transfer of its entire water-shed and drainage into the Rockaway river instead of the Pequannock; the thick drift in the Delaware river valley, and that of Flat brook and Mill brook; various alluvial deposits; the great temporary

lakes formed by the modified glacial drift, such as that thirty miles long and six to eight wide, now covered by towns, made by the ice of the receding glacier at Paterson and having final outlet in the valley of the Passaic; the transported drift along the Delaware river south of the terminal moraine, and the pre-glacial drift of the southern part of the State of so different a character; all illustrate a study of the greatest import in its bearing on questions of surface biology, of drainage for health, and on diseases as thus modified.

Our attention has been very closely called to a study of periodic fevers and malarial influences, under the guidance which these lines of demarcation furnish. Future students of the telluric or earth conditions which affect population, will be as successful in showing the economic bearing of such studies as have been the geologists in bringing order out of chaos and in defining the laws of industrial development. For our natural resources are as much in a preserved and healthy population as in the ground on which it treads.

In addition to these sanitary outlines of deep and of surface geology, we need also to bear in mind those surface changes which have been made by the upheavals and infillings of constructive art. Canals and railroads are so numerous as quite to have altered surface soil and surface contour in whole districts. The excavations of mines often make hills from the buried earth and valleys or pond holes of grave import to health. The iron, the marl, the glass sand, the clay and other industries that involve displacements of ground have made many such changes in this State.

Also, the fact that so many towns have sprung up near the outlets of rivers into tide-water, has caused many a marsh to be covered over without adequate drainage, sometimes by materials totally unfit for filling in. Any one who will study the sanitary map of Hudson county, as prepared under the supervision of this Board, or that of Elizabeth, will see the significance of these changes. Similar ones are being made in many of our sea-coast towns. All excavations for buildings also have their bearing on surface geology. It is for this reason that all basements and other like excavations, and especially those in cities, need to be carefully studied in relation to soil formation and drainage. The effect of such changes is often made apparent in the records of disease, and so the need of remedy indicated.

Having thus acquainted ourselves with the material earth on which we live, or which is adjacent to us, we need still more particularly to study the topography or contour of its surface. When we follow the

courses of its mountains and valleys, its rivers and lakes, and the bordering of bays and ocean, the student of physical geography is able to estimate with more or less accuracy the bearing of these on vegetable and animal life and especially upon that of human beings. Indeed, just as the flora and fauna of a district guide to its character, so the diseases often serve to describe the telluric conditions. As close observers and series of well-observed facts increase, the relations become apparent, and what is at first entertained as a working hypothesis, becomes an ascertained fact and a practical guide in conserving health. Now that we have a topographical map of Northern New Jersey and will have one for the whole State, we have great advantages for such inquiries. Besides the effect of earth structure and surface elevation, or of large bodies of water, we need also to know of the woods as great condensers, and of all vegetable and soil and earth-covering as modifying moisture or other elements of climate in a way admitting of approximate estimation.

But the most important modifying factor as to surface geology as related to health is that which depends upon the river system and the various water-sheds of the State. These are well presented in the river system of New Jersey as tabulated on pages 276 and 277.

RIVER SYSTEM OF NEW JERSEY.

ATLANTIC OCEAN.	Hudson River.	Wallkill.	Black Creek. Wallkill. Papakating River.	
	NEWARK BAY.	Passaic River.	Pompton River.	Ramapo River. Wanaque Creek. Pequannock River.
			Passaic River. Rockaway River. Whippany River.	
		Hackensack River.	Saddle River.	
	RARITAN BAY.	Raritan River.	North Branch.	Black River. Lamington River.
			South Branch.	
			Millstone River.	Stony Brook.
			Green Brook. South River.	
	Staten Island Sound.	Rahway River.		
	Sandy Hook Bay.	Navesink River. Shrewsbury River.		
	Shark River Inlet.	Shark River.		
	Manasquan Inlet.	Manasquan River.		
	Barnegat Bay.	Metedeconk River. Toms River. Cedar Creek.		
	Great Bay.	Little Egg Harbor, or Mullicas River.	Mullicas River. Wading River. Batsto River.	
	Egg Harbor.	Great Egg Harbor River.	Tuckahoe River.	
	DELAWARE BAY.	DELAWARE RIVER.	Flat Brook.	Big Flat Brook. Little Flat Brook.
			Paulinskill. Pequest River. Pohatcong River. Musconetcong River. Assanpink Creek. Crosswicks Creek.	
			Rancocas Creek.	North Branch. South Branch.
			Cooper's Creek. Big Timber Creek. Mantua Creek. Raccoon Creek. Oldman's Creek. Salem Creek. Alloways Creek.	
		Cohansey Creek. Maurice River.		

RIVER SYSTEM—CONCLUDED.

NAME.	Length in Miles.	REMARKS.	Drainage Area. Square Miles.
Black Creek	10	To the State line	
Papakating River	15	To the junction with the Wallkill	
WALLKILL	25	To the State line	203
RAMAPO RIVER	33	From the State line to the Pompton	47
Wanaque Creek	19	From the State line to the Pompton	89
Pequannock River	40		95
Rockaway River	38		165
Whippany River	19		59
PASSAIC RIVER	80		974
Saddle River	18	From the N. Y. line to the junction with the Hackensack	57
HACKENSACK RIVER	30	From the State line to Newark Bay	132
Lamington River	25	Including the Black River	135
North Branch	24		85
South Branch	50		280
Millstone River	35		280
Stony Brook	20		55
Green Brook	15		63
South River	30	Including Manalapan Creek	122
RARITAN RIVER	80	Including the South Branch	1000
RAHWAY RIVER	22		62
Navesink River	22	Including Swimming River and Hop Brook	88
SHREWSBURY RIVER	10		20
SHARK RIVER	11		
MANASQUAN RIVER	22		60
METEDECONK RIVER	22	Including the North Branch	100
TOMS RIVER	30		157
CEDAR CREEK	20	Including the East Branch	70
Batsto River	18		70
Wading River	28	Including the East Branch	140
LITTLE EGG HARBOR or MULLICAS RIVER	42		476
TUCKAHOE RIVER	26		100
GREAT EGG HARBOR RIVER	41		425
Big Flat Brook	14		
Little Flat Brook	9		
Flat Brook	10	From the junction of Big and Little Flat Brooks	50
Paulinskill	38		163
Pequest River	30		168
Pohatcong Creek	26		58
Musconetcong River	40		162
Assanpink Creek	21		105
Crosswicks Creek	25		151
Rancocas Creek	32	Including the North Branch	329
Cooper's Creek	17	Including the South Branch	55
Big Timber Creek	15	Including the South Branch	56
Mantua Creek	18		51
Raccoon Creek	29	Including the North Branch	58
Oldman's Creek	23		43
Salem Creek	34		109
Alloways Creek	18		285
DELAWARE RIVER	220	From Carpenter's Point to Delaware Bay, including large and small tributaries	2100
COHANSEY RIVER	31		100
Maurice River	45	Including Little East River	360

SUMMARY OF DRAINAGE AREAS OF NEW JERSEY.

The Hudson River receives through the Wallkill and its tributaries in New Jersey the drainage of	203	sq. miles.
The Hackensack River drains	130	"
The Passaic River drains	980	"
The Raritan River drains	1,000	"
The Delaware River drains	2,100	"
The Maurice River drains	360	"
The Mullicas or Little Egg Harbor River drains	476	"
The Great Egg Harbor River drains	425	"
Total	5,674	sq. miles.

The above-named rivers are the larger streams in the State, draining about seven-tenths of the whole area. The remaining three-tenths are drained by the numerous smaller streams that empty either directly into the Atlantic ocean, or into the bays which lie along the coast.

Classified according to the Atlantic and Delaware river and bay slopes we have the following result:

The Delaware River and Bay receives the drainage of	2,850	sq. miles.
The Atlantic Ocean	4,523	"
The Hudson River	203	"
Total area of the State	7,576	sq. miles.

Such lakes as Lake Hopatcong and Budd's lake, in the highest part of the Highlands, Greenwood lake, in Passaic county, or Green pond, and many other smaller sheets of water known as lakes or ponds, need to be studied in respect to adjacent drainage, and to the water and land area they represent.

The various bays along the coast not only have a sea and river connection, but amid the tide-marshes are various creeks, quite complete in their connections with each other and needing much to be studied in their bearing on the health of localities, and especially as to the indications whether or not to use them as conduits for sewage.

The rain-fall also needs to be borne in mind in its relation to water-courses, water-supply and drainage. This is not the measure of humidity, because the quantity of moisture in the air is subject to changes which are not always expressed by atmospheric precipitation, either in the form of rain or snow. As the humidity can be measured as well as the rain-fall, we have means of recording their relation to each other, to temperature, &c. The rain-fall of the State may in general be noticed as increasing in depth in going from north to south and from northwest to southeast. Before a station was established at Newton, Goshen, in Orange county, with an average of 33.82 inches for eight years, served as an approximation. Easton, Pa., gives a

record for five years of 45.56 inches. These mark the extremes of the azoic and paleozoic districts. Paterson has the average for five years of 60.69 inches, and has long been noticed for its excessive rain-fall, which is above the region it represents. Newark, for thirty-nine and eight-tenths years, has an average of 46.48 inches; New Brunswick, for twenty-nine years, of 45.42 inches; Freehold, for eight years nine months, 46.39 inches; Vineland, for seventeen years, 49.00 inches; Cape May, for eleven years six months, 47.30 inches; Sandy Hook, for nine years, 51.99. While it is well to have these general outlines, both humidity and rain-fall need to be studied by days and weeks in relation to temperature, to former or succeeding droughts, to freshets or sudden rain-falls in short periods, and so watched as affecting sudden increases or decreases of disease, the local and general tables of vital statistics being compared therewith.

It is very evident that, in the care of the public health, great attention must be given to the preservation of the natural drainage or to its substitution where, for any reason, the natural channel is interfered with. Also, to the multiplication of drainage channels where population is crowding into smaller areas.

Whether a given stream or part thereof is to be preserved wholly for drainage and water-supply, or whether it shall be made available for mill-dams or for the delivery of sewage, and if so, whether it can, in whole or in part, be used as a water-supply? These are questions so much depending upon locality, upon river-bed, upon course and rapidity of current, upon rain-fall and upon the relations of cities, that they need to be discussed specifically as regards each area, rather than to be decided by general statements.

A comprehensive study of health and of vital statistics must take all these into account as well as the sea front, the various bays and creeks and the tide-marsh, and closely consider those parts of the State which stand in need of extended drainage. English and American observation and medical experience so establish the connection of undrained localities or interrupted water-courses and forced vegetable decompositions with malarial fevers, with consumption and other lung diseases, as well as with zymotic diseases, resulting from dampness and filth and heat combined, that we must, in the interests of population, closely compare the results in the State as variously, but definitely, modified by local conditions.

CLIMATOLOGY.

Connected with this and partly as an outcome therefrom, is the study of CLIMATOLOGY as related to earth structure. It is "the science which treats of the causes which affect the climate of a particular place."

It is a mistake to regard climate as a mere question of longitude and latitude, with which we have no concern. Were this true we would study its laws, if definite, so as to adapt ourselves thereto, or to seek such as we needed. But, as besides this, climate is itself modified by local conditions and its effects upon us personally admit of being modified both by our mode of dealing with ourselves and our surroundings, we cannot lose sight of a certain causal or modifying relation thereto. If all diseases were, as some are believed to be, dependent on the presence of septic particles having specific vegetable life, yet as development or power for malignant harm depends "upon the abundance and kind of pabulum furnished," and upon winds, moisture or other climatological conditions, we need to know how to estimate each of these.

One of the first questions that addresses itself to the sanitarian is how far it is practicable to study climatology and the relation of the earth in seeking the prevention or mitigation of disease.

With very many there is an impression that most diseases are either a result of weather conditions, or that their mildness or malignity is very much determined thereby. There is enough of connection between weather and disease to give credence to this view. We know that seasons have diseases quite peculiar to themselves and that different degrees of heat or cold or humidity are very sure to increase or decrease the mortality from certain diseases. These may be called the more general influences.

"Catarrhal fever," says Prof. Pepper, "arises from the ordinary causes of catarrhal inflammation, of which atmospheric conditions and changes are by far the most common cause." If we associate with this the remark of Reindfleisch, that "the larger half of all the diseases to which humanity is liable, consist of catarrhal affections of mucous membrane, or of disorders complicated with them," we see that locality must rank as an important factor.

In another class of cases, the specific causes of disease are either atmospheric in their origin or are so conveyed by winds or by dampness as to be transferred from one locality to another. The westward movement of cholera, the advance of influenza, and the uniform pro-

gression of some of the epizootics are beyond controversy. The term "epidemic constitution of the atmosphere" does not mean precisely what was intended by it in its first use, but it does mean a condition of atmosphere either producing, or conveying, or favoring, the spread of a disease. But what is spoken of as "the epidemic constitution of the atmosphere," is often only potent because art has laden or modified the atmosphere; because abnormal local filth or decomposition, either in the person or surroundings, gives the prolific soil or stagnant moisture and accumulated heat force it into intense productivity.

It seems that contagious particles or the entities of various diseases have different relations to the atmosphere. Some cling to the surface of the ground or other surfaces. Some are more easily wafted hither and thither. This may depend on a varying specific gravity or other conditions which modify the laws of diffusion. For instance, we can conceive of particles so coated with a film of oil as not to be readily diffused in the atmosphere. We have evidences that a stratum of air sometimes moves through the other strata and seems to preserve an individuality that does not readily admit of dilution. In passing over hills or amid marshy lands, even where the same sunshine reaches us, or in riding the open country, we pass through strata of air greatly differing in temperature and in organic impurity. How the rapid removal of forests or the upheaval of soil affects humidity, rain-fall and general temperature and has modifying results on climate and health, is already known.

Admitting that human control over weather conditions is partial and inadequate, this would not prove that the study is not of practical sanitary usefulness. There still would remain that more essential and life-saving study of the especial local conditions which under specified states of weather cause the greatest disturbance of vital functions. Much of the prowess of a good sanitarian, like that of a great general, is in his genius for thwarting combinations. The divisions of the great army of destruction must not be allowed to join forces. The victory is in preventing the massing of the forces, and that victory means saved lives. It is by close record of the effects of the same climatic conditions upon varying conditions of population and their surroundings that we come to know what are the safest and what the most dangerous methods of life. The different records of city and country in the same vicinity, or of different blocks in the same city, may show both what conditions of weather are most fraught with

risk and just where and why the risk is greater at one point than at another.

It is by just such studies as these that we are able approximately to determine what conditions of weather or climate produce the most favorable or unfavorable results on disease. Already there are enough gleams of knowledge to show that the facts are discoverable, although for so many reasons difficult of discovery. This justifies the acumulation of the facts, but does not justify artificial combinations of the facts, or some generalizations in which we are slow to concur. The labors of such men as Mr. Glaisher, of England, and Professor Loomis, of America, show what progress is being made by those who study with closest accuracy, and give promise of results such as must have important bearings upon the prevention of disease.

The importance of the subject still more impresses itself upon our attention from the fact that so many varieties of climate can be found within the State. Our northern boundary is in great contrast with our extreme south; while from east to west and from mountain to seashore there are diversities of climate such as no other State in the Union can present. The southern and eastern portion of the State, a region about one hundred miles long from north to south, and thirty-five miles wide from east to west, is remarkable for the small extremes between the mean temperature of summer and winter. "In the *average daily range of temperature*, Cape May is more equable than *Aiken, S. C., Jacksonville, Fla., San Diego, Cal., San Antonio, Texas*, and many other noted health resorts. In fact, in the low range it comes near Key West. Of course its *minima* are lower than those of the above-named places—although the differences are not so great as differences of latitude would lead us to expect." By accurate and long records of the weather conditions of localities and of the effects of our various climates in various diseases, we shall come to know what changes of locality to advise and how the health of our citizens can thus be conserved. It is often quite interesting to notice how atmospheric conditions are modified by difference of exposure, by prevailing winds or protection therefrom, by ground moisture, by bodies of water, by woodlands, or of dry, loose, uncovered soils, or by the relations of mountain and valley, of lake and ocean. Thus the study of climatology, or of the weather, is not merely a study of meteorological conditions.

The facts as to climate are to be deduced from various records and observations accurately made and stated, and then alongside of these

a similar record of disease. This record does not fail to show ascertainable and often controllable relations.

It is of interest to note how within a few miles changes occur, and how real are the advantages which sometimes follow from changes that involve only short distances of travel.

Our comparative studies of climatology, or weather conditions, date from July 1st, 1878, when our present system of vital statistics commenced. As the meteorological observations cannot and need not be made in every township and city of the State, we give observations at points which fairly represent the natural geological and climatological districts into which the State is divisible.

I. Newton, Sussex county, will be taken to represent the Kittatinny valley, and the sandstone, slate and adjacent rock.

II. Paterson, located on trap rock, well represents some slight variations for the same general district, and so the two stand for Northern New Jersey, or that part mostly of azoic and paleozoic formation.

III. Newark will represent the eastern part of the red sandstone section.

IV. New Brunswick, Princeton and Trenton will represent the western red sandstone section.

V. Freehold, amid the sand and clay marls, will represent the cretaceous formation, as well as in general the inland portion of Monmouth county.

VI. The tertiary formations and the climate as varied by relations of land and water, will be shown by Vineland.

VII. Cape May, on a similar sandy formation, stands for the Atlantic coast of the extreme south, with the adjacent influence of Delaware bay. Here and at Barnegat we rely on the Signal Service report. That of Barnegat is the one at hand this year.

VIII. Either Middletown, Red Bank or Sandy Hook represents our northern Atlantic coast and the minglings of sand and of clay marls of cretaceous formation.

Other points of comparison are afforded by the records of the Signal Service. (See, also, page 284 of Fifth Report.)

The records at some of these points are slightly defective, but can be supplied by adjacent data in time for semi-decennial comparison. We have now perfected a system so as to secure reports from each of these points, which we believe will be permanent and reliable and much aid to sanitarians in their comparisons. Each city of over 5000 inhabitants should avail itself of weekly or monthly reports so as to study the immediate connection with varying death-rates.

The observers are as follows:

Newton, Miss E. Foster.

Paterson, J. S. Hilton, C. E.

Newark, Hon. Wm. A. Whitehead, or Arthur Ward, M. D.

New Brunswick, Prof. J. C. Smock.

Freehold, Chas. F. Richardson, A. M.

Vineland, John Ingram, M. D.

Middletown or Red Bank, Frank Osborn, C. E.

Barnegat, Cape May, etc., United States Signal Service.

Physicians or climatological observers, who will, at least every three years, furnish to this Board their judgment as to local causes of disease, will at any time, on notice by postal, be furnished with a geological map for comparisons.

NOMENCLATURE, OR THE REVISED CLASSIFICATION OF DISEASES.

"The *nomenclature* is of as much importance in this department of inquiry as weights and measures in the physical sciences. The superiority of a classification can only be established by the number of facts which it generalizes, or the practical results to which it leads.

"A statistical nosology, to throw the clearest light upon the health of a nation, should be founded upon the mode in which diseases affect the population."—*Farr*.

The great progress which has been made in medical knowledge has necessitated many changes in the names and orders of disease. These have been from time to time made with great care, as new discoveries in pathology have indicated. The one until recently in use in England, Scotland and Wales had been changed but little within twenty years. It had been reprinted in this country by the Hospital Marine Service and generally accepted by physicians and in all offices of vital record. In 1880, the National Board of Health invited a conference of the principal Bureaus of Vital Statistics in the United States. A similar recognition of the need of correction was entertained by the Registrar-General of Great Britain. Conferences were had with a committee appointed by the United States and a careful review of the nomenclature was instituted. This has resulted in the adoption of some modifications which are used for the first time in the English reports recently printed. While reference to the instructions and nomenclature, as published by this Board in 1878, is important, we herewith give the classification as now adopted:

LIST OF DISEASES REPORTED AS CAUSES OF DEATH ADOPTED IN THE NEW FORMS OF THE REGISTRAR-GENERAL OF ENGLAND.

[It will be understood that the names of the groups are provisional only. Asiatic cholera and yellow fever would be placed under miasmatic diseases.]

I.

SPECIFIC FEBRILE DISEASES, OR ZYMOTICS.

1. *Miasmatic diseases.*

Small-pox { Vaccinated. Unvaccinated. No statistics.
Chicken-pox.
Measles.
Epidemic rose-rash.
Scarlet fever.
Typhus.
Relapsing fever.
Influenza.
Whooping-cough.
Mumps.
Diphtheria.
Cerebro-spinal fever.
Simple continued fever.
Enteric fever.
Other miasmatic diseases.

2. *Diarrhœal diseases.*

Simple cholera.
Diarrhœa, dysentery.

3. *Malarial diseases.*

Remittent fever.
Ague.

4. *Zoogenous diseases.*

Hydrophobia.
Glanders.
Splenic fever.
Cow-pox and vaccination.

5. *Venereal diseases.*

Syphilis.
Gonorrhœa, stricture of the urethra.

6. *Septic diseases.*

Phagedæna.
Erysipelas.
Pyæmia, septicæmia.
Puerperal fever.

II.

PARASITIC DISEASES.

Thrush.
Other vegetable parasitic diseases.
Hydatid disease.
Other animal parasitic diseases.

III.

DIETIC DISEASES.

Starvation, want of breast milk.
Scurvy.
Intemperance. { Chronic alcoholism.
Delirium tremens. }

IV.

CONSTITUTIONAL DISEASES.

Rheumatic fever, rheumatic heart.
Rheumatism.
Gout.
Rickets.
Cancer, malignant disease.
Tabes mesenterica.
Tubercular meningitis.
Phthisis.
Scrofula, tuberculosis.
Purpura, hæmorrhagic diathesis.
Anæmia, &c.
Diabetes mellitus.
Other constitutional diseases.

V.

DEVELOPMENTAL DISEASES.

Premature birth.
Atelectasis.
Cyanosis.
Spina bifida.
Imperforate anus.
Cleft palate, hair lip.
Other congenital defects.
Old age.

VI.

LOCAL DISEASES.

1. *Diseases of nervous system.*

Inflammation of brain.
Apoplexy.
Softening of brain.
Hemiplegia, paralysis.
Paralysis agitans.
Hydrocephalus (not acute.)
Insanity (general paralysis of insane.)
Chorea.
Epilepsy.

Convulsions.
Laryngismus stridulus.
Idiopathic tetanus.
Paraplegia and disease of cord.
Others, nervous system.

2. *Diseases of organs of special sense.*

Otitis, otorrhœa.
Epistaxis and disease of nose.
Ophthalmia and disease of eye.

8. *Diseases of circulatory system.*

Endocarditis, valvular disease.
Pericarditis.
Hypertrophy of heart.
Angina pectoris.
Syncope.
Aneurism.
Senile gangrene.
Embolism, thrombosis.
Phlebitis.
Varicose veins.
Others, circulatory system.

4. *Diseases of respiratory system.*

Laryngitis.
Croup.
Others, larynx, trachea.
Emphysema, asthma.
Bronchitis.
Pneumonia.
Pleurisy.
Other diseases of respiratory system.

5. *Diseases of digestive system.*

Stomatitis.
Dentition.
Sore throat, quinsy.
Dyspepsia.
Hæmatemesis.
Melæna.
Disease of stomach.
Enteritis.
Ulceration of intestines.
Ileus, obstruction of intestines.
Stricture and strangulation of intestines.
Intussusception of intestines.
Hernia.
Fistula.

Peritonitis.
Ascites.
Gallstones.
Cirrhosis of liver.
Others, liver disease.
Others, digestive system.

6. *Diseases of lymphatic system.*

Disease of lymphatics.
Disease of spleen.

7. *Diseases of gland-like organs of uncertain use.*

Bronchocele.
Addison's disease.

8. *Diseases of urinary system.*

Nephritis.
Bright's disease, albuminuria.
Uræmia.
Suppression of urine.
Calculus.
Hæmaturia.
Disease of bladder and prostate.
Others, urinary system.

9. *Diseases of reproductive system.*

a. Diseases of organs of generation.

Ovarian disease.
Disease of uterus and vagina.
Disorder of menstruation.
Pelvic abscess.
Perineal abscess.
Disease of testes, penis, &c.

b. Diseases of parturition.

Abortion, miscarriage.
Puerperal mania.
Puerperal convulsions.
Placenta prævia, flooding.
Phlegmaria dolens.
Other accidents of childbirth.

10. *Diseases of locomotor system.*

Caries, necrosis.
Arthritis, ostitis.
Others, locomotor system.

11. *Diseases of integumentary system.*

Carbuncle.
Phlegmon, cellulitis.
Lupus.
Ulcer, bed-sore.
Eczema.
Pemphigus.
Others, integumentary system.

VII.

DEATH FROM VIOLENCE.

1. *From accident or negligence.*

Fracture, contusion.
Gunshot wounds.
Cut, stab.
Burn, scald.
Poison.
Drowning.
Suffocation.
Otherwise.

2. *From homicide.*

Murder, manslaughter.

3. *From suicide.*

Gunshot wounds.
Cut, stab.
Poison.
Drowning.
Hanging.
Otherwise.

4. *By execution.*

Hanging (execution.)

VIII.

DEATHS FROM ILL-DEFINED CAUSES.

Dropsy.
Debility.
Atrophy and inanition.
Mortification.
Tumor.
Abscess.
Hemorrhage.
Sudden (cause unascertained.)
Not specified, or ill-defined.

CONDENSED

CLIMATOLOGICAL RECORDS,

FOR FOUR STATISTICAL YEARS,

Commencing July 1st, 1878, and ending July 1st, 1882, with Additional Records for the Six Months from July 1st, 1882, to January 1st, 1883.

Station, State Agricultural College Farm. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, THEODORE WEST.

	BAROMETER. Reduced to 32 deg.			THERMOMETER.			Mean humidity.	Prevailing wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1882.												
July	......	......	......	91	59	70.7	......	N. E., W. S. W.	3.04	......	......	......
August	......	......	......	93	54	69.5	......	E. S. E., W. S. W.	3.20	......	......	......
September	......	......	......	90	50	64.7	......	E. N. E., W. S. W.	15.52	......	......	......
October	......	......	......	78	41	56.2	......	N. E., W. S. W.	1.42	......	......	......
November	......	......	......	71	16	37.2	......	W.	1.60	......	......	......
December	......	......	......	45	4	27.8	......	W. S. W.	1.91	......	......	......

* Including melted snow.

Rainfall from P. V. Spader, Esq.; kept in city. 1882, Rainfall of summer showed a deficiency. Autumn, warm until November 14th. Storm of September 21st–24th heaviest rainfall on record. October was noted for its warmth and dull weather. November marked by heavy snow-fall on 29th. Frosts kept off until very late—until in November. A noteworthy high percentage of easterly winds in July, August, September and October.

Station, Lombardy Street, Newark, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, W. A. WHITEHEAD.

	BAROMETER.			THERMOMETER.			Mean humidity.	Prevailing wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1882.												
July	30.82	29.80	30.53	96½	55	76.82	......	W. N. W.	3.57	......	6	17
August	30.35	29.70	29.06	93¼	52½	73.81	......	S. E.	1.81	......	7	16
September	30.25	29.70	30.06	86	47	66.75	......	N. E.	17.66	......	13	17
October	30.45	29.90	30.14	72¼	41	57.05	......	N. E., S. E.	2.00	......	11	14
November	30.55	29.88	30.22	70	19	40.52	......	N. W.	1.77	4	5	13
December	30.45	29.78	30.14	46¾	10¾	30.59	......	N. W., S. W.	1.95	9	6	11

* Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

ORSERVER, F. OSBORN, C. E.

	BAROMETER. Reduced to 32 deg.			THERMOMETER.			Mean humidity.	Prevailing wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Maen.						
1882.												
July	......	......	......	96	54	73.98	......	......	......	......	......	......
August	......	......	......	91	55	71.16	......	......	......	......	......	......
September	......	......	......	88	52	68.68	......	......	......	......	......	......
October	......	......	......	79	39	57.11	......	......	......	......	......	......
November	......	......	......	78	15	41.42	......	......	......	......	......	......
December	......	......	......	61	7	30.54	......	......	......	......	......	......

* Including melted snow.

METEOROLOGICAL SUMMARY FROM JULY 1ST, 1882, TO JANUARY 1ST, 1883.

Station, Dennis Library, Newton, N. J. Latitude, 41° 2′ 45″ N.; Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.															
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean humidity.	Prevailing wind.	Rain (inches.)*	Snow (inches.)	Days when precipitation equaled 0.01.	Cloudy days.	Rainfall on days.	Thunder and lightning on days.	Snowfall on days.	Fog.	Hail.	Frost.	Lunar halos.
1882.																			
July	29.576	28.829	29.263	94.7	58.3	74.16	74.41	S. W.	2.40	trace.	8	3	9	2	1	......	......	......	......
August	29.603	28.868	29.298	96.1	50.0	72.06	79.28	S. W.	3.68	....	8	11	10	3	......	8	......	......	......
September	29.538	28.912	29.318	86.0	40.2	65.11	87.0	N. E.	9.36	....	12	12	18	5	......	4	1	......	1
October	29.623	28 981	29.343	74.0	36.0	55.51	88.66	N. E.	2.595	trace.	13	14	15	......	1	12	......	2	5
November	29.780	28.880	29.376	68.2	18.2	39.25	80.41	N. E.	1.20	12.0	4	10	5	......	5	1	1	7	6
December	29.677	28.863	29.302	48.0	6.9	29.19	70.43	N. W.	1.85	3.3	8	15	7	......	9	3	......	4	5
For the half Year	29.632	28.829	29.315	77.83	34.10	55.88	80.08	....	21.085	15.3	53	65	64	10	16	28	2	13	17

* Including melted snow.

REMARKS.—July, 1882, had a greater range of temperature and a higher humidity than that of 1881; remarkable for the absence of cloudy days and fogs; auroras were frequent; snow fell on the 5th; diphtheria was prevalent near the middle, and sciatica near the latter part, of the month. August had an excess of dews, fogs and mists; from the 1st to the 8th, winds were from points between N. E. and S. S. E., and with an increasing temperature and heavy, oppressive night atmosphere; several cases of diphtheria took a fatal form. September was more equable; all the general rains were accompanied by thunder and lightning; no sickness appeared until after the excessive rainfall of the latter part of the month, then one death from consumption, and neuralgia on the increase. October was misty, foggy and dewy; from the 16th to the 19th dense fogs and heavy atmosphere characterized the nights and days; during that period there was one death from pneumonia, and diphtheria re-appeared; rainfall was deficient, though there were 94 hours of precipitation. November, first frost on the 3d; ground frozen on 3d and 4th; one case of malarial dysentery on 5th; snow covered the ground 10 days in latter half of the month; there was a marked presence of ozone previous to the snowfalls. Autumn, 1882, unusual prevalence of N. E. winds. December was a steadily cold month; mean (sheltered) temperature was nearly 10 degrees below the mean of December, 1881; there were 26 days when the minimum temperature was 32 degrees or less; snow on the ground 16 days; neighborhood unusually free of sickness; a mild case of diphtheria appeared on the 28th.

Tables of Climatology as arranged for Comparison with Vital Statistics and with Conditions Affecting Disease.

Station, Newton, N. J. Latitude 41° 2′ 45″ N.; Longitude 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.												
July	......	......	......	92.0	64.0	78.08	......	S. W., N.	......	......	11	7
August	......	......	......	85.0	58.0	73.69	......	S. W.	......	......	9	8
September	......	......	......	86.0	42.0	68.16	......	S. E., E.	......	......	8	7
October	......	......	......	78.0	36.0	41.96	......	S. W.	......	......	11	6
November	......	......	......	59.0	28.0	44.15	......	N. W.	......	2	10	12
December	29.742	28.138	29.223	62.0	9.0	25.96	75.11	W., N. W.	4.74	2	16	16
1879.												
January	29.714	28.779	29.278	49.0	5.0	18.18	75.26	S. W., N. W.	2.75	17	7	11
February	29.968	28.641	29.293	44.0	3.0	22.19	74.11	N. W., N. E.	2.56	3	12	13
March	29.936	28.638	29.361	60.0	9.0	33.18	77.50	N. W., N. E.	3.87	6	11	16
April	......	......	......	80.6	26.0	50.25	......	N. W.	......	3	11	10
May	......	......	......	84.0	45.0	50.66	......	S. W.	......	......	6	6
June	......	......	......	92.0	54.0	73.27	......	S. W.	......	......	9	3
For the Year	29.840	28.549	29.287	72.58	30.75	48.56	75.49	......	13.92	33	121	116

* Including melted snow.

1878, July—Hot, and frequent thunder-showers. August—Very humid. September—Warm and dry. October—Drouth. November—Rains and fogs. December—Cold, icy winds; very humid.

1879, January—Hazy and windy. February—Snow on the ground the entire month. March—Very humid. April—Northwest winds. May—Dry; seven frosts. June—Warm and dry.

There were nineteen fogs and thirteen thunder-storms during the year.

Station, Newton, N. J. Latitude 41° 2′ 45″ N.; Longitude 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1879.												
July	......	......	......	96.0	60.0	60.29	......	S. W.	......	......	6	3
August	......	......	......	92.0	56.0	72.18	......	S. W.	......	......	7	7
September	......	......	......	86.0	40.0	63.62	......	S. W.	......	......	5	7
October	......	......	......	84.0	30.0	61.58	......	S.	......	......	3	7
November	......	......	......	76.0	16.0	44.26	......	N. W.	......	5	9	7
December	......	......	......	62.0	10.0	35.29	......	N. E.	......	8	10	14
1880.												
January	......	......	......	60.0	10.0	39.79	......	S. W.	......	4	10	13
February	......	......	......	66.0	5.0	37.78	......	S. W.	......	6	5	11
March	......	......	......	72.6	18.0	38.68	......	N. W.	......	12	10	15
April	......	......	......	78.0	34.0	51.72	......	N. W.	......	......	7	12
May	......	......	......	92.0	40.0	69.40	......	S. W.	......	......	5	10
June	......	......	......	91.0	50.0	72.90	......	S. W.	......	......	6	5
For the Year	......	......	......	79.58	30.75	58.96	......	......	......	36	88	111

*Including melted snow.

1879, July—Dry and windy. August—Rains from northeast; hot sun; humid. September, October and November—Warm, dry and windy. December—Hazy; frequent mists.

1880, January—Very humid; nine days of fog. February—First part clear and cold; latter, hazy and warm. March—Very humid. April—Dry and windy. May and June—Hot and dry.

There were twenty-five fogs and five thunder-storms during the year.

Station, Newton, N. J. Latitude 41° 2′ 45″ N.; Longitude 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	Barometer. Reduced to 32 degrees.			Thermometer.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1880.												
July	......	......	......	90.0	62.0	74.78	......	N. W.	......	......	9	10
August	......	......	......	88.0	51.0	72.63	......	S. W.	......	......	6	8
September	......	......	......	88.0	48.0	66.58	......	S. W.	......	......	6	11
October	29.681	28.750	28.965	77.1	29.8	50.99	70.3	S. W., N. W.	1.70	......	9	12
November	29.944	28.851	29.459	67.8	10.5	36.67	67.1	S. W.	1.68	8.0	10	15
December	29.684	28.910	29.249	45.0	7.9	25.62	74.6	N. W., S. W.	2.73	15.7	12	21
1881.												
January	29.862	28.630	29.341	48.8	5.0	21.88	74.97	N. E., N. W.	4.06	20.25	9	18
February	29.997	28.689	29.068	56.0	6.0	28.82	68.25	N. W., N. E.	0.60	6.5	5	11
March	29.580	28.882	28.998	58.0	17.0	35.80	68.0	N. E., N. W.	......	5.0	7	16
April	29.569	28.579	29.118	83.0	17.0	47.22	53.18	N. W.	......	trace.	2	7
May	29.735	28.874	29.294	95.0	30.5	61.30	70.0	S. W., N. E.	......	......	8	9
June	29.421	28.910	29.017	88.7	40.8	65.17	70.38	N. W., N. E.	5.12	......	16	12
For the Year	29.719	28.718	29.167	72.86	23.98	48.94	68.58	....	15.89	50.45	99	151

*Including melted snow.
1880, July to October—Very dry and warm; ten frosts. November and December—Very cold and dry.
1881, January to March—Cold and humid. Very little rain from March to June.
There were nine days of fog and eleven thunder-storms during the year.

Station, Newton, N. J. Latitude 41° 2′ 45″ N., Longitude 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	Barometer. Reduced to 32 degrees.			Thermometer.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1881.												
July	29.544	28.870	29.208	95.2	57.8	74.66	67.88	N. W., S. W.	2.005	......	10	9
August	29.541	28.904	29.281	97.0	52.4	73.94	73.26	N. W., S. W.	1.48	......	4	8
September	29.608	29.189	29.350	99.0	50.4	72.47	81.94	S. S. W.	2.20	......	11	11
October	29.810	28.735	29.378	84.9	31.2	55.94	84.80	S. W.	4.70	......	9	15
November	29.863	28.797	29.380	68.2	19.6	42.72	79.63	S. W.	3.23	2	12	12
December	29.805	28.552	29.352	63.0	17.0	39.09	76.80	S. W., N. E.	4.76	5	14	17
1882.												
January	29.983	28.578	29.338	48.8	6.8	26.81	74.20	N. W.	5.62	34	16	15
February	29.928	28.731	29.334	56.9	10.5	33.52	70.84	S. W., N. W.	4.11	18.5	9	7
March	29.864	28.775	29.296	67.0	16.0	39.37	65.04	N. W.	3.185	4.5	12	14
April	29.750	28.618	29.255	72.2	21.9	46.17	64.01	N. E., S. W.	2.09	2.5	12	14
May	29.671	28.703	29.239	85.0	30.2	54.57	70.06	N. E.	6.86	......	18	16
June	29.520	28.712	29.145	94.9	46.0	70.05	66.05	S. W.	4.00	......	11	3
For the Year	29.740	28.759	29.296	77.67	28.85	52.44	72.83	....	43.74	61.5	139	141

*Including melted snow.
July to October—Drouth; heavy dews, fogs and mists throughout the Summer and Autumn. Dry wells and cisterns, brooks and ponds low in September. December—Very humid and variable. January—Mists and fogs. February—Cellars flooded with water from 15th to 25th. Spring months cold and backward April and May had low night temperature. June—Frequent thunder-showers, that on 19th accompanied by large hail-stones.
There were forty-one fogs, thirty-four frosts and thirty thunder-storms during the year.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain, (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1878.												
July	......	......	......	......	......	......	......	......	4.01	......	10	....
August	......	......	......	......	......	......	......	......	3.88	......	9	....
September	......	......	......	......	......	......	......	......	2.45	......	7	....
October	......	......	......	......	......	......	......	......	2.52	......	7	....
November	......	......	......	......	......	......	......	......	4.98	1	11	....
December	......	......	......	......	......	......	......	......	7.80	2	8	....
1879.												
January	......	......	......	......	......	......	......	......	2.63	16	7	....
February	......	......	......	43	9	28	......	......	2.22	12.50	10	....
March	......	......	......	62	25	39	......	......	5.39	4.50	12	....
April	......	......	......	70	28	50	......	......	3.99	......	10	....
May	......	......	......	84	48	64	......	......	3.91	......	10	....
June	......	......	......	88	56	73	......	......	3.97	......	12	....
For the Year	......	......	......	......	......	......	......	......	47.80	36	......	....

* Including melted snow.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain, (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1879.												
July	......	......	......	96	61	76	......	......	5.18	......	11	....
August	......	......	......	92	58	71	......	......	7.89	......	9	....
September	......	......	......	80	42	68	......	......	3.28	......	8	....
October	......	......	......	80	28	60	......	......	.32	......	5	....
November	......	......	......	70	17	40	......	......	1.15	3.50	7	....
December	......	......	......	60	16	34	......	......	5.56	7.25	11	....
1880.												
January	......	......	......	62	11	36	......	......	2.90	3	9	....
February	......	......	......	63	5	35	......	......	4.16	10.25	12	....
March	......	......	......	62	19	37	......	......	6.73	14	14	....
April	......	......	......	80	30	52	......	......	4.31	......	12	....
May	......	......	......	88	32	72	......	......	.85	......	3	....
June	......	......	......	97	50	76	......	......	2.90	......	8	....
For the Year	......	......	......	......	......	52.67	......	......	45.32	38	......	....

* Including melted snow.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1880.												
July				92	61	79			12.06		12	
August				98	52	74			6.92		10	
September				93	48	68			3.36		6	
October				69	33	53			5.57		9	
November				67	9	40			5.60	3.50	10	
December				47	—6	34			2.41	14	9	
1881.												
January				44	—3	25			7.83	18.25	8	
February				57	—5	26			6.95	10.25	11	
March				84	24	36			16.11	1.50	9	
April				82	24	46			1.74		4	
May				87	35	63			3.69		11	
June				86	49	66			11.74		14	
For the Year						50.31			83.48	48		

* Including melted snow.

Station, City Hall, Paterson, N. J. Latitude 40° 55′ N.; Longitude 74° 11′ W.
Height of Rain Gauge above Sea Level, 142 Feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1881.												
July				92	66	74			2.48		7	
August				95	60	77			1.13		7	
September				98	56	73			1.46		9	
October				84	31	57			2.76		9	
November				68	24	45			4.86	1	11	
December				57	16	37			7.87	.25	15	
1882.												
January				51	—5	30			4.59	24.75	14	
February				52	16	35			5.39	12	11	
March				24	6	33			5.80	.75	10	
April				73	30	45			3.39		11	
May				85	35	56			13.46		16	
June				95	56	66			8.50		10	
For the Year							53		62.69	38.75		

* Including melted snow.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer. Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.												
July	30.15	29.7	29.9	98.25	61.5	78.25	......	N. W., S.	4.3	......	12	10
August	30.19	29.73	29.96	90.5	55	73.09	......	N. W., S. W.	3.06	......	10	10
September	30.52	29.85	30.18	88	43.75	67.46	......	N. E., S. E.	2.53	......	10	12
October	30.40	29.62	30.01	76.75	35	56.40	......	N. W., S. W.	2.83	......	8	6
November	30.58	29.08	29.81	58	27	43.65	......	N. W., S. W.	4.57	......	9	9
December	30.50	28.85	29.68	57.75	13.5	31.82	......	N. W., W.	4.68	......	7	8
1879.												
January	30.52	29.36	29.94	46.75	—2	25.68	......	N. W., S. W.	2.89	......	11	6
February	30.78	29.45	30.11	49.75	10.5	27.68	......	N. W., S. W.	2.58	......	16	13
March	30.7	29.37	30.04	63	16.5	38.42	......	N. W., S. W.	3.75	......	17	10
April	30.4	29.43	29.91	76.25	24.5	67.96	......	N. W., S. W.	4.76	......	10	6
May	30.52	29.8	30.16	88.75	37.75	63.83	......	N. W., S. W.	2.175	......	6	5
June	30.3	29.22	29.75	93	48	71.55	......	S. W., W.	3.04	......	12*	5
For the Year	......	......	......	......	......	......	......	......	......	......	......	......

*Including melted snow.
1878—Snow on six days, 4.25 inches.
1879, January—Snow on eight days, 17.75 inches, and rain together, 2.89. February—Thirteen days of snow, 13 inches, and rain together, 2.58. March—Four days of snow, 1.25 inches, and rain together, 3.75. April—Snow on five days and rain together, 4.76.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer. Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1879.												
July	30.3	29.72	30.01	99.25	58	75.36	......	N. W., S. W.	5.05	......	8	7
August	30.2	28.85	29.52	90	54	71.75	......	W., S. W.	9.12	......	8	9
September	30.4	29.85	30.12	86.75	38.75	63.45	......	S. W., W.	3.75	......	6	9
October	30.7	29.50	30.10	82	26.5	50.36	......	S. W., N. W.	.32	......	3	4
November	30.5	29.50	30	71	17	41.76	......	W., N. W.	1.94	......	7	20
December	30.7	29.7	30.204	59	11.5	35	......	S. W., N. W.	5.33	......	11	10
1880.												
January	30.67	29.71	30.24	60	13.5	37.64	......	E., N. W.	2.59	......	[illegible]	5
February	30.66	29.612	30.158	62.75	8	35.099	......	N. W., S. W.	2.88	......	7	6
March	30.55	29.61	30.127	67	16.5	37.45	......	N. W., S. W.	4.9	......	12	8
April	30.4	29.58	30.07	82	26.25	51.75	......	N. W., S. W.	3.30	......	12	[illegible]
May	30.3	29.71	30.07	95	35	68.38	......	S. W., N. W.	.76	......	6	3
June	30.32	29.68	30.07	94.25	49.25	73.69	......	S. W., N. W.	1.18	......	7	6
For the Year	......	......	......	......	......	......	......	......	......	......	......	......

*Including melted snow.
1879, December—Snow on seven days to 7.5 inches.
1880, January had only one measurable snow, 2 inches. February—One day of snow to 6 inches. March—On four days to 10 inches.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1880.												
July	30.25	29.75	30.02	92	56.5	75.31	......	W., S. W.	7.46	......	14	5
August	30.44	29.75	30.09	96	50.75	72.25	......	S., S. W.	4.68	......	11	10
September	30.35	29.7	30.04	96	47.75	65.95	......	N. W., S. W.	2.48	......	6	6
October	30.37	29.54	30.09	76	31.75	52.7	......	N. W., S. W.	2.1	......	8	5
November	30.75	29.7	30.27	65	14.25	38.48	......	N. W., S. W.	2.36	......	6	6
December	30.5	29.8	30.08	44	—5	26.89	......	W., N. W.	2.68	......	9	10
1881.												
January	30.66	29.4	30.17	40.25	—5	24.44	......	W., N. W.	5.05	......	6	9
February	30.85	29.45	30.24	51.25	—3	27.94	......	W., N. W.	4.64	......	9	5
March	30.38	29.17	29.83	57	21.75	37.27	......	W., S. W.	6.83	......	11	9
April	30.31	29.5	29.94	80.75	22	48.53	......	N. W., S. W.	1.72	......	5	6
May	30.46	29.51	30.08	92.5	38	64.11	......	N. E., S. E.	2.91	......	13	6
June	30.2	29.65	29.42	90	49.5	66.75	......	N. E., S. E.	5.04	......	17	15
For the Year	....	....	....	......	......	......	......	....	......	......	......	....

*Including melted snow.
1880—November had two days of snow, 3 inches.

Station, Newark, N. J. Latitude 40° 21′ N.; Longitude 2° 20′ E. Height of Barometer Cistern above Sea Level, 225 feet.

OBSERVER, W. A. WHITEHEAD.

	Barometer. Reduced to 32 degrees			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1881.												
July	30.25	29.65	29.44	98	59.25	75.07	......	N. W., S. W.	1.84	......	7	11
August	30.52	29.65	30.02	98	56.5	75.64	......	E., W.	0.28	......	5	2
September	30.35	29.9	30.13	100.5	50.75	73.72	......	N. E., S. E.	0.87	......	7	6
October	30.58	29.62	30.14	88	33.75	57.98	......	N. W., S. W.	2.73	......	17	5
November	30.65	29.63	30.19	68.71	22.25	44.10	......	N. W., S. W.	3.07	......	15	7
December	30.68	29.4	30.19	66.5	19.25	39	......	N. W., S. W.	4.53	......	10	5
1882.												
January	30.8	29.35	30.18	48	8	28.6	......	N., N. W., W.	5.80	......	10	8
February	30.75	29.54	30.19	53.5	11.75	33.61	......	S. W., N. W.	4.73	......	9	7
March	30.69	29.65	30.14	60.5	17.75	40.13	......	N. W., S. W	3.19	......	10	4
April	30.46	29.55	30.08	72.5	26	46.94	......	N. W., S. W.	2.01	......	10	6
May	30.48	29.54	30.05	83.25	34	55.23	......	N. E., S. E.	5.69	......	12	5
June	30.27	29.5	30.02	96	49.5	73.78	......	N. W., W.	2.08	......	6	7
For the Year	....	....	....	......	......	......	......	....	......	......	......	....

*Including melted snow.

Station, Agricultural College Farm, New Brunswick, N. J. Latitude, 40° 29′ N.: Longitude, 74° 26′ W. or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.												
July	....	....	....	98	68	75.3	......	S. W.	5.18	......	......	....
August	....	....	....	87	54	70.9	......	W. S. W.	2.59	......	......	....
September	....	....	....	86	42	65.2	......	E. N. E.	2.28	......	......	....
October	....	....	....	78	35	56.1	......	W. S. W.	3.15	......	......	....
November	....	....	....	59	22	41.9	......	W. N. W.	2.99	......	......	....
December	....	....	....	60	18	31.4	......	W. N. W.	4.98	......	......	....
1879.												
January	....	....	....	45	—8	28.6	......	W. S. W.	1.58	......	......	....
February	....	....	....	56	8	25.7	......	W. N. W.	1.80	......	......	....
March	....	....	....	66	20	36.6	......	W N. W.	4.27	......	......	....
April	....	....	....	70	27	45.1	......	W. N. W.	2.71	......	......	....
May	....	....	....	93	41	61.5	......	W. S. W.	3.84	......	......	....
June	....	....	....	95	50	68.3	......	W. S. W.	4.56	......	......	....
For the Year	....	....	....	96	—8	50.1	......	....	39.88	......	......	....

* Including melted snow.

1878—Summer warmer than average. July—Very hot month. Rainfall below mean. Autumn moderately warm and rains well distributed. September—Marked by easterly winds.

1878-9—Winter one of the coldest recorded. Steady cold weather, but no very low depressions in temperature. Deficiency in rainfall.

1879—Spring marked by great changes of temperature. Moderate rains throughout the season.

Station, Agricultural College Farm, New Brunswick, N. J. Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1879.												
July	....	....	....	98	59	73.3	......	W. S. W.	1.90	......	......	....
August	....	....	....	91	58	70.6	......	W. S. W.	7.86	......	......	....
September	....	....	....	86	43	63.8	......	W. S. W.	1.80	......	......	....
October	....	....	....	84	29	58.9	......	W. S W.	†	......	......	....
November	....	....	....	72	14	41.1	......	W., S. W., S.	1.78	......	......	....
December	....	....	....	60	9	35.6	......	W. S. W.	4.14	......	......	....
1880.												
January	....	....	....	61	5	36.6	......	W. S. W.	1.92	......	......	....
February	....	....	....	67	8	34	......	W. S. W.	1.45	......	......	....
March	....	....	....	72	19	35.6	......	N. N. W.	4.80	......	......	....
April	....	....	....	81	30	47.9	......	W. S. W.	1.56	......	......	....
May	....	....	....	98	37	65.2	......	S. W.	.65	......	......	....
June	....	....	....	97	49	71.9	......	W. S. W.	1.47	......	......	....
For the Year	....	....	....	97	5	52.8	......	....	29.33	......	......	....

* Including melted snow.

† .08 inches at Spader's house, New Brunswick.

1879—Summer, excepting July, average temperature. July—Marked by high maximum and slight rains. August—Large rainfall and rather cool.

Autumn dry and warm. September 7th to November 18th only very light and infrequent rains. A prevalence of southerly winds in November.

1879-80—Winter warmest recorded here. No extremely low temperature. Rainfall much below mean amount. No sleighing snows. No sudden changes. Winds, W. S. W. and N. E., former prevailing.

1880—Spring very dry. Drought in May, but one rain (30th), and month with extremely high temperature.

Station, Agricultural College Farm, New Brunswick, N. J. Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	Barometer. Reduced to 32 degrees. Max.	Barometer. Min.	Barometer. Mean.	Thermometer. Max.	Thermometer. Min.	Thermometer. Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1880.												
July	....	....	....	95	61	76.8	......	S. S. W.	7.89	......	......	....
August	....	....	....	90	69	73.0	......	S. S. W.	4.08	......	......	....
September	....	....	....	89	47	65.0	......	S. W.	1.86	......	......	....
October	....	....	....	79	33	51.9	......	W. S. W.	1.98	......	......	....
November	....	....	....	63	11	36.7	......	W. S. W.	2.08	......	......	....
December	....	....	....	47	—8	26.0	......	W. N. W.	2.46	......	......	....
1881.												
January	....	....	....	45	—7	22.7	......	W.	7.85	......	......	....
February	....	....	....	52	—1	26.7	......	W. N. W.	4.87	......	......	....
March	....	....	....	58	22	34.4	......	W. S. W.	4.51	......	......	....
April	....	....	....	75	21	43.4	......	W.	.43	......	......	....
May	....	....	....	90	42	62.7	......	N. E., S. W.	2.53	......	......	....
June	....	....	....	88	50	64.7	......	N. E., S. W.	5.94	......	......	....
For the Year	....	....	....	95	—8	48.6	......	....	44.92	......	......	....

* Including melted snow.

1880—Spring hot and dry. May—Characterized by Summer temperature, followed by Summer, which was warm. June—Had long-continued heat-periods, and drought continued into July. Months of July and August had frequent rains and no excessive heat. Autumn dry and cool.

1880-1—Winter began in November, and continued 158 days, of average temperature of 29.28° (November 22d, 1880, to April 22d, 1881.) The season was unusually steady and cold. Heavy snowfalls. Good sleighing for six weeks. Winter marked also by absence of sudden excessive changes.

1881—Spring cold through March and April. Light rains. May had wide range of temperature. June was delightful and low range. Rains frequent but not excessive. N. E. winds frequent in May.

Station, Agricultural College Farm, New Brunswick, N. J. Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, THEODORE WEST.

	Barometer. Reduced to 32 degrees. Max.	Barometer. Min.	Barometer. Mean.	Thermometer. Max.	Thermometer. Min.	Thermometer. Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1881.												
July	....	....	....	90	60	71.7	......	W. S. W.	.86	......	......	....
August	....	....	....	99	60	72.1	......	W. S. W.	1.78	......	......	....
September	....	....	....	108	59	72.4	......	S. S. W.	.94	......	......	....
October	....	....	....	89	35	58.5	......	W. S. W.	2.26	......	......	....
November	....	....	....	69	30	44.1	......	W.	3.13	......	......	....
December	....	....	....	61	19	39.8	......	W. S. W.	3.92	......	......	....
1882.												
January	....	....	....	48	—3	29.5	......	W. S. W.	5.49	......	......	....
February	....	....	....	55	15	35.5	......	W. S. W.	4.24	......	......	....
March	....	....	....	59	28	38.9	......	W. S. W.	2.62	......	......	....
April	....	....	....	76	27	44.3	......	W. S. W.	2.83	......	......	....
May	....	....	....	83	35	51.7	......	N. E., W.	5.29	......	......	....
June	....	....	....	95	54	67.3	......	W. S. W.	1.48	......	......	....
For the Year	....	....	....	108	—3	51.88	......	....	34.78	......	......	....

* Including melted snow. Rainfall from records of P. V. Spader, Esq.

1881—Autumn was noted for its long and severe drought.

1881-2—Winter was remarkable for its mildness. Only one cold period, January 24th, when a temperature of —3 was observed. Rainfall in excess of average.

1882—Spring cold and backward. Frequent rains. Summer marked by warm waves. Mean temperature below average.

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Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	Barometer. Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
1878.													
July	29.94	29.40	29.72	95	59.5	75.60	77.5	W.	5.68	......	12	6	8
August	29.91	29.41	29.66	86	58.5	71.30	83.2	W.	6.72	......	16	7	8
September	30.19	29.45	29.87	85	42.5	65.65	83.6	W.	3.08	......	13	10	5
October	30.05	29.23	29.76	76	33.5	55.41	74.9	N. W.	2.39	......	9	5	2
November	30.25	28.78	29.71	59	25.4	42	78.6	W.	3.13	......	14	7	1
December	30.21	29.57	29.72	59	12	31.11	75.8	W.	6.61	3.97	16	4	1
1879.													
January	30.22	29.23	29.76	49	—3	25.53	74	W.	2.68	13.5	12	7	....
February	30.47	29.18	29.78	54	8	26.77	72.8	W.	3.12	8.7	19	8	....
March	30.40	29.07	29.82	65	17	38.01	77.7	W.	3.56	.5	23	8	3
April	30.09	29.12	29.65	72	23	45.42	74.9	W.	4.47	.4	14	12	3
May	30.23	29.48	29.81	92	36	61.90	76	S.	2.43	......	9	5	6
June	30.01	29.26	29.71	94	46	70.13	77.7	W.	4.72	......	13	4	11
For the Year	....	....	29.74	......	......	50.74	77	....	48.43	27.07	157	84	48

* Including melted snow.
1879, June—2 frosts. May—6 frosts. April—8 frosts.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	Barometer. Reduced to 32 degrees. Max.	Min.	Mean.	Thermometer. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
1879.													
July	30.01	29.31	29.72	97	56	73.8	78.3	W.	5.45	......	10	6	10
August	29.90	29.44	29.70	98	51	70.8	83.4	W.	9.58	......	10	10	6
September	30.17	29.53	29.89	85	37	61.4	80.2	W.	1.86	......	6	2	6
October	30.50	29.83	29.92	83	25	58.5	79.6	W.	.68	......	9	3	2
November	30.31	29.26	29.92	72	16	41.5	74.2	W.	1.71	1.85	7	7	1
December	30.41	29.53	29.97	60	8	36.7	80.3	N. W.	6.77	4.75	12	14	
1880.													
January	30.45	29.54	30	59	11	38.2	81.4	W.	2.06	4	11	6	1
February	30.37	29.24	29.95	67	9	34.8	76.1	W.	2.69	9.70	11	7	....
March	30.23	29.41	29.92	69	16	36.9	74.2	N. W.	5.71	15.40	15	11	....
April	30.11	29.50	29.84	82	23	49.7	67.5	N. W.	2.91	......	12	8	3
May	30.05	29.57	29.82	95	32	68	69.2	W.	.82	......	6	4	5
June	30	29.47	29.76	94	49	72	71.6	W.	1.58	......	7	4	6
For the Year	....	....	29.88	......	......	53.5	76.3	....	41.84	35.70	119	84	45

* Including melted snow.
1879, September—2 frosts. October—4 frosts. November—17 frosts. 1880, April—6 frosts. May—3 frosts.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1880.													
July	29.91	29.58	29.75	90	54	78.9	78.7	N. W.	3.57	......	15	5	13
August	30.14	29.32	29.82	89	50	74.3	81	S.	4.17	......	9	9	9
September	30.17	29.48	29.84	88	46	65.2	79.6	W.	2.87	......	6	4	3
October	30.15	29.31	29.88	79	31	51.1	77	N. W.	2.61	......	11	6	1
November	30.45	29.49	30	65	9	37	72.6	W.	3.44	4.3	10	7	1
December	30.19	29.42	29.79	49	—11	25.5	73.2	N. W.	6.58	51.2	12	10	....
1881.													
January	30.36	29.19	29.91	41	—7	22.5	75.3	W.	7.85	9.3	12	10	....
February	30.53	29.25	29.95	58	—6	27.3	80.1	N. W.	6.82	11.4	12	10	1
March	30.12	28.97	29.55	59	21	36.3	75.6	N. W.	7.14	3	11	13	1
April	30.09	29.27	29.67	76	21	44.9	70.6	W. N. W.	1.07	......	5	8	1
May	30.21	29.43	29.82	91	35	60.1	80.7	S. E.	2.78	......	13	9	7
June	29.93	29.44	29.79	90	47	64.5	81.3	W. N. W.	7.78	......	16	9	9
For the Year	....	....	29.81	......	......	48.5	77.1	....	61.49	79.7	132	100	46

* Including melted snow.
1880, October—11 frosts. November—19 frosts.

Station, Freehold, N. J. Latitude 40° 15′ N.; Longitude 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHAS. F. RICHARDSON.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.	Thunder and Lightning on days.
	Max.	Min.	Mean.	Max.	Min.	Mean.							
1881.													
July	30	29.42	29.71	90.2	56	78.5	73.7	W.	.70	......	7	4	6
August	30.08	29.44	29.79	96	54	72.3	78.7	S. W.	3.18	......	7	4	8
September	30.18	29.64	29.86	102	46	71.5	80.6	S. S. W.	2.65	......	8	9	6
October	30.29	29.29	29.90	85	30	57.5	79.8	W.	3.45	......	12	9	3
November	30.39	29.42	29.98	69	20	44.4	79	W.	3.55	......	12	11	....
December	30.31	29.22	29.89	63	17	33.8	82.4	W.	3.87	25	16	13	....
1882.													
January	30.51	29.14	29.94	48	—3	29.2	75.2	W.	5.42	8.44	19	13	....
February	30.43	29.24	29.89	56	17	33.7	75.8	W. N. W.	5.17	14.5	13	8	1
March	30.33	29.34	29.87	61	16	30.5	70.9	N. W.	2.82	2.5	12	9	1
April	30.28	29.24	29.82	75	24.5	45.6	68.5	W.	2.40	.3	13	9	3
May	30.19	29.28	29.81	82	30	53.8	75.1	W.	4.51	......	13	10	1
June	30.02	29.38	29.70	94	46.5	69.5	70	S. W.	3.44	......	12	1	8
For the Year	....	....	29.84	......	......	51.7	75.9	....	41.11	50.74	144	100	37

* Including melted snow.
1881, October—3 frosts. November—13 frosts. 1882, March—18 frosts. April—7 frosts. May—2 frosts.

Station, Vineland, N. J. Latitude 39° 39′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.
	Max.	Min.	Mean.	Max.	Min.	Mean.					
1878.											
July	29.98	29.48	29.79	96	66	77.9	80	S. W., S. E.	6.42	......	8
August	30.02	29.55	29.78	92	57	73.2	82	S. W., N. E.	3.46	......	10
September	30.29	29.52	29.99	86	42	68	80	S. W., N. E.	.69	......	5
October	30.14	29.02	29.89	78	32	56.2	76	S. W., N. W.	2.18	......	7
November	30.33	28.82	29.81	61	28	42.9	79	N. W., S. W.	3.85	......	7
December	30.31	28.66	29.83	60	9	31.7	67	N. W., S. W.	5.69	1.75	9
1879.											
January	30.36	29.29	29.90	63	–4	28.9	68	S. W., N. W.	3.75	5	6
February	30.60	29.31	29.89	58	7	29.6	71	N. W., S. W.	3.38	5.75	6
March	31.51	29.29	29.96	68	18	41	82	N. E., S. W.	3.36	......	10
April	30.34	29.30	29.76	83	30	48.3	80	N. W., S. W.	3.47	......	9
May	30.29	29.67	29.91	92	46	63.4	74	S. W., N. W.	.77	......	4
June	30.09	29.36	29.83	94	44	75.3	78	S. W., N. W.	4.91	......	9
For the Year	30.36	29.27	29.89	77	–3	52.9	76	....	45.1	11.50	90

*Including melted snow.

Station, Vineland, N. J. Latitude 39° 39′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	Barometer. Reduced to 32 degrees.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.
	Max.	Min.	Mean.	Max.	Min.	Mean.					
1879.											
July	30.10	29.40	29.82	97	46	75.3	73	S. W., S.	3.04	......	7
August	30.06	29.53	29.79	94	49	72.2	77	S. W., N. E.	10.6	......	10
September	30.29	29.62	29.96	91	38	65.5	75	N. W., S. W.	3.4	......	7
October	30.59	29.38	29.99	92	28	63.8	76	S. W., N. W.	1.10	......	7
November	30.41	29.38	29.98	80	18	48.1	74	N. W., S. W.	2.80	4.80	7
December	30.45	29.54	30.01	70	12	41.7	72	S. W., N. W.	6.27	15	13
1880.											
January	30.45	29.52	30.04	61	10	41.3	71	N. W., S. W.	2.82	5	12
February	30.39	29.01	29.97	69	12	29.1	60	S. W., N. W.	2.26	1.75	7
March	30.31	29.14	29.86	74	20	40.9	69	N. W., N. E.	6.35	......	13
April	30.16	29.41	29.81	83	23	53.1	65	N. W., S. W.	2.61	......	12
May	30.09	29.61	29.87	96	34	69.2	68	N. W., S. E.	2	......	5
June	30.11	29.58	29.84	97	52	74.7	69	S. W., N. W.	3.05	......	6
For the Year	......	......	29.91	......	......	56.07	73	....	47	26.55	106

*Including melted snow.

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Station, Vineland, N. J. Latitnde 39° 29′ N.; Longitude 75° .01′ E. Height of Barometer Cistèrn above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	BAROMETER. Reduced to 32 degrees. Max.	Min.	Mean.	THERMOMETER. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1860.												
July	30.02	29.56	29.84	98	56	76.45	73	S. W., N. W.	3.64	......	8	....
August	30.23	29.59	29.51	90	50	73.08	77	S. W., N. E.	6.64	......	8	....
September	30.16	29.59	29.90	92	44	66.83	80	S. W., N. W.	2.94	......	5	....
October	30.27	29.42	29.97	80	30	64.11	71	N. W., N. E.	2.75	......	9	....
November	30.59	29.50	30.08	67	9	38.22	68	S. W., N. W.	4.44	4.50	9	....
December	30.38	29.58	29.91	50	−10	26.23	56	N. W., S. W.	7.53	39	10	....
1861.												
January	30.49	29.16	30	46	−10½	25.31	61	N. W., S. W.	6.81	9.50	10	....
February	30.60	29.31	29.93	56	−6	29.96	61	N. W., S. W.	5.61	14	9	....
March	30.07	26.88	29.53	62	22	36.86	76	N. W., S. W.	5.28	......	9	....
April	30.07	29.31	29.75	83	26	27.36	69	S. W., N. W.	1.30	......	5	....
May	30.26	29.49	29.75	94	44	64.36	72	S. W., N. E.	3.50	......	10	....
June	29.93	29.53	29.74	94	54	69.74	79	S. W., N. W.	4.57	......	11	....
For the Year	....	....	29.84	......	......	50.85	72	....	59.99	67	102	....

*Including melted snow.

Station, Vineland, N. J. Latitude 39° 29′ N.; Longitude 75° .01′ E. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M. D.

	BAROMETER. Reduced to 32 degrees. Max.	Min.	Mean.	THERMOMETER. Max.	Min.	Mean.	Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1861.												
July	30.04	29.53	29.78	97	60	77.90	68	S. W., N. W.	2.96	......	6	....
August	30.17	29.54	29.90	100	56	76.44	62	S. W., N.	.65	......	4	....
September	30.16	29.71	29.94	104	58	76.76	68	S. W., N. W.	2.35	......	4	....
October	30.37	29.47	30.03	92	50	61.72	61	S. W., N. W.	3.12	......	8	....
November	30.54	29.59	30.07	78	24	48.56	68	N. W., S. W.	3.05	......	9	....
December	30.46	29.36	30.05	68	18	41.98	62	S. W., N. W.	3.04	......	10	....
1862.												
January	30.67	29.06	30.06	62	......	34.68	65	N. W., S. W.	6.46	11	15	....
February	30.66	29.22	30.02	60	18	33.06	66	N. W., S. W.	5.41	12	8	....
March	30.51	29.49	29.97	62	21	41.46	61	N. W., S. W.	4.31	3	12	....
April	30.35	29.31	29.81	80	26	48.25	69	S. W.	2.19	......	9	....
May	30.27	29.37	29.86	86	32	56.70	73	S. W., N. E.	5.49	......	10	....
June	30.08	29.48	29.79	96	50	71.68	67	S. W., N. W.	1.36	......	4	....
For the Year	....	....	29.94	......	......	56.17	......	....	40.59	26	99	....

*Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, FRANK OSBORN.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1879.												
July	....	....	....	96	55	73.23	......	....	......	......	......	....
August	....	....	....	92	53	71.09	......	....	......	......	......	....
September	....	....	....	88	42	64.15	......	....	......	......	......	....
October	....	....	....	91	27	61.56	......	....	......	......	......	....
November	....	....	....	78	13	44.31	......	....	......	......	......	....
December	....	....	....	73	6	37.56	......	....	......	......	......	....
1880.												
January	....	....	....	69	12	40.64	......	....	......	......	......	....
February	....	....	....	75	7	35.57	......	....	......	......	......	....
March	....	....	....	71	18	37.91	......	....	......	......	......	....
April	....	....	....	86	22	50.04	......	....	......	......	......	....
May	....	....	....	99	31	67.06	......	....	......	......	......	....
June	....	....	....	97	48	72.33	......	....	......	......	......	....
For the Year	....	....	....	......	......	......	......	....	......	......	......	....

* Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, FRANK OSBORN.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1880.												
July	....	....	....	92	56	74.98	......	....	......	......	......	....
August	....	....	....	93	52	72.67	......	....	......	......	......	....
September	....	....	....	96	48	66.81	......	....	......	......	......	....
October	....	....	....	81	30	55.12	......	....	......	......	......	....
November	....	....	....	68	9	38.95	......	....	......	......	......	....
December	....	....	....	51	—11	27.37	......	....	......	......	......	....
1881.												
January	....	....	....	50	—3	25.09	......	....	......	......	......	....
February	....	....	....	54	—6	28.44	......	....	......	......	......	....
March	....	....	....	62	18	37.21	......	....	......	......	......	....
April	....	....	....	83	17	46.96	......	....	......	......	......	....
May	....	....	....	96	33	61.17	......	....	......	......	......	....
June	....	....	....	58	41	64.84	......	....	......	......	......	....
For the Year	....	....	....	......	......	......	......	....	......	......	......	....

* Including melted snow.

Station, Middletown, N. J. Latitude ° ′ N.; Longitude ° ′ E. Height of Barometer Cistern above Sea Level, feet.

OBSERVER, FRANK OSBORN.

	BAROMETER. Reduced to 32 degrees.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches.)*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1881.												
July				91	58	72.79						
August				99	56	74						
September				107	52	73.66						
October				89	32	58.22						
November				72	20	46.30						
December				70	—5	39.96						
1882.												
January				53	—5	28.56						
February				69	14	35.92						
March				70	15	41.24						
April				76	22	45.63						
May				79	29	58.14						
June				98	47	66.76						
For the Year												

* Including melted snow.

The full tables for Barnegat, Cape May and Sandy Hook, for five years, will be in the next report.

SYNOPSIS OF VITAL RETURNS.

The records of the statistical year ending July 1st, 1882, as given in the tables accompanying this report, show an aggregate of 59,287 returns, of which 8837 are marriages, 23,108 births, and 25,942 deaths. For the former year the returns were 8109 marriages, 23,484 births, and 20,812 deaths. The record is subject to some variations from supplementary returns too late for the annual record. Still births are included in the total, but not included in the returns of death. These for last year were 1476, and 1400 for 1881–2.

It will be seen that the chief variation is caused by an increase in the number of deaths. As next year will complete a quinquennial period, we shall reserve more extended tables and analyses of all returns for five years for the next report, and confine our chief present attention to an inquiry into the causes of this great increase in the returns of deaths, and our examination of the localities which are chiefly responsible for this aggregate. An increase of over 5000 deaths in a single year, may well attract our attention to an inquiry into the significance of the various influences which have aided to make this increase, and especially into such as admit of limitation.

Some consideration must undoubtedly be given to those climatic influences which do not admit of alteration, but as to which we need to learn the laws of adjustment and so practically protect ourselves from the disturbing or critical effects.

The summer of 1881, to which the first part of the record relates, had been preceded by a winter of remarkable length and of severe and steady cold. Such a winter is always depressing to such aged persons as are not in good health, and to that large class of children who suffer from inadequate provision in food, clothing or shelter. A comparison of the deaths from acute lung diseases and from consumption shows an increased record over both of the two preceeding years, which was quite evenly distributed through the various counties. This severe winter continued until late in the spring, was succeeded by the high temperature and severe drought of the summer

of 1881. The drought so continued until October as to make scarcity of water almost to the time of winter freezing. The effect of this prolonged heat and dryness is not slow to make its record in diarrheal or intestinal diseases and fevers and especially upon the younger population. If this were the whole of the story, we would need only to record the accident, and, as not having control of the weather, submit to it, with grief over an unalterable dispensation. But when we see how different are the effects of these climatic conditions on different townships and counties, on rural districts as compared with cities, and on different populations, and, as we know from other sources, on different parts of the same city, we find that disease and death derive their ratios to life not so much from these changes as they do from that local pollution which poisons an arrow otherwise not deadly, and from that artificial susceptibility which makes many a life a plant that withers in the sunshine which gives growth and vigor to the same species living on a proper soil. Thus if we look at this increase of over 5000 deaths, we at once perceive that 1357 of the increase was in Hudson county and 1258 in Essex county, making in these two counties about half of the total increase, their population being about one-third of that of the whole State.

Hudson county is so much a county of cities that the county death-rate represents a close population. In Jersey City especially the death-rate among children has been very high. Nine hundred and eight children died under one year of age, being an increase of 220 over the former year. Between one and five years there was an increase of 251. It is scarcely necessary to emphasize the insanitary condition of much of Hudson county, but when able to compare its cities and those townships which either contain the dependent or criminal population of the city or have special nuisances, with the two or three more rural townships, it is easy to see that the death rate is owing to artificial causes. The appended analysis by C. J. Rooney, Jr., the efficient Registrar of the county Board, is not only a valuable local outline, but a warning to those portions of the State that have not yet allowed sanitary problems to become too complicated for ready solution.

LETTER OF C. J. ROONEY, JR.

"DEAR SIR—In accordance with your request, I beg leave to present the following brief report of the vital statistics of Hudson county during the year July 1st, 1881, to June 30th, 1882.

"During the above-mentioned period Hudson county suffered the high death rate of 29.5 to 30 per 1000 persons living; the rate varying somewhat according to different estimates of the present population.

"The total deaths were 5862; and the greatest number prior to this report was 5233, in 1881, and before that, 4513, in 1876.

"Assuming the lower rate (29.5) to be correct, it is an unusually high one for this county; the highest, in fact, experienced since the records were begun in 1874.

"The average rate for the seven years ending December 31st, 1881, (records of Hudson county Board of Health,) was 23.9. Thus, it may be seen that the rate for the year ending June 30th, 1882, was 5.6 per 1000 above the average for seven years. The mortality of the year 1881 approached nearest to this, the rate being 27 per 1000; and, previous to that, the rate of the year 1876, 26.8, was highest.

"The death rates from 1874 to 1881 inclusive, have varied from 20.9 to 27. This will help to a comprehension of the meaning of the present rate.

"The larger part of the increase of the rate took place in the latter half of the year, January to July, 1882; that is to say, the rate of each month from January to July, 1882, as compared with the same months of previous years, showed a greater increase above the average than the months from July to December, 1881, did above the average for the same period of former years. Each month sustained a rate above the average for the same month for five preceding years of from 3.5 to 9.6 per 1000, the greatest increase being in January 1882, and the next greatest in December, 1881. July, 1881, and January, 1882, with rates of 36 and 33.8, making these respectively the most lethal months of the period.

"The greater part of the increase of mortality took place among persons over five years old. The rate for children under five years old was 13.7; that of persons over five years of age was 15.8.

"According to Hudson county Health Board records, the average for children under five for seven years ending December, 1881, was 11.7; hence, that of the period at present under consideration was 2 per 1000 above the average for this class of decedents.

"According to the same authority, the average rate of death of persons over five years old for seven years ending 1881, was 12.1; so that this year's rate for this class of deaths was 3.7 above the average.

"Upon examining into the causes of the increased mortality, the following named diseases are found to have been the chief factors:

Consumption, small-pox, pneumonia, croup, scarlet fever, diphtheria typhoid and typho-malarial fevers, measles, bronchitis and meningitis. Of these, small-pox, consumption, pneumonia and bronchitis were most notable.

"The rate of death from consumption was 3.3 per 1000, as compared with a seven-year average of 2.6. It was most prominent in October, 1881, January, March and May, 1882.

"Pneumonia, in January, March, April, May and June, 1882, showed the greatest increase when compared with the same disease in the same months of other years.

"Scarlet fever, from December, 1881, to June, 1882, and typhoid fevers, in October, November, December, 1881, March and April, 1882, were most fatal when contrasted with other years.

"If I may anticipate next year's report, I will say that since July, 1882, to time of present writing (December 1st, 1882,) there have not been any deaths from small-pox and no cases are known, none having been reported for some months. The system of general and school vaccination carried on by this Board, assisted by a corps of physicians who generously gave their services to the county without charge, seems to have checked and exterminated the disease.

"The number of births reported was 3207, of marriages, 1504, and of still births, 311. This is a poor showing for the promptness and fidelity of the physicians in complying with the requirements of law as to reporting births.

"The clergymen and justices have done better than ever before.

"I will again anticipate by saying that, at the direction of this Board, I have sent postal notices to all who were delinquent or not prompt in the matter of returning, and the resulting responses would seem to indicate that not only will return be made in future, by all upon whom the duty of reporting devolves, but that the returning will be characterized by promptness, and that the legal limit of thirty days' grace will not be overstepped.

"In looking over the record of mortality by cities and towns, it may be seen that the death rate in Jersey City, Hoboken, Bayonne, (cities,) Harrison, (town,) West Hoboken, Guttenberg, Kearny and Union, (townships,) fell more or less *below* the mean county rate. In the cases of town of Union, North Bergen and Weehawken townships the rate rose considerably above the mean county rate. In the cases of all these places, the rates are higher than for the other yearly rates in the table, with the exception that the rates for Hoboken and

Kearny were lower than for 1881. The high rate of North Bergen township resulted from the outbreak of typho-malarial fever in the winter and spring months of 1882 in the almshouse, and from the fact that so many of the county institutions, having usually a very high death rate, are located here. The small-pox hospital is situated in this township.

"The table here appended shows the area and population of the different 4340 districts and is valuable for reference.

Names of Cities, &c.	Population. Census 1880.	Area in Acres.	Sq. Miles.
Jersey City	120,728	8,000	12.50
Hoboken City	30,999	720	1.12
Bayonne City	9,372	2,500	3.90
Town of Harrison	5,510	760	1.20
Town of Union	5,849	275	.43
Town of Guttenberg	1,206	....	....
Township West Hoboken	5,441	520	.81
Township North Bergen	4,268	6,800	10.62
Township Kearny	2,165	6,400	10
Township Union*	1,310	835	1.30
Township Weehawken	1,102	400	.62

*This township divided (1878) into Guttenberg, (town,) and Union township."

The increase of 1258 deaths in Essex county depends chiefly on an increase of 1028 in the city of Newark. While the death rate under one is large, the rate between one and five is especially indicative of some local conditions which affect this portion of the growing population.

For the State at large, the increase of deaths under one year has been 1305; for from one to five years, 1590; from five to twenty years, 810; from twenty to sixty, 762, and over sixty, 476.

The loss of about 2300 children more under five years and the comparatively less number that reach an age beyond sixty years, are related facts. The causes that destroy the infant population tell on those who still live, and a county with a high child death rate always finds that in older life there is limit of age and limit of power.

It is not needful, in this synopsis, to follow out all the comparisons that can be made between different localities and different cities or between the ages and the diseases which destroy so many lives. But all through these tables, the vital statistician and the sanitarian will not fail to perceive indications or to get on the trail of inquiries which are informatory and most helpful in guiding to the necessity of more intelligent health administration. It is hoped, the next year, to give some comparative sketches of statistics over a period of time and relating to an amount of population which eliminates many limited or accidental or temporary influences. We only draw attention to these in order that physicians and sanitarians may be aiding in these inquiries. The tables in connection with this report show in detail the deaths by townships, by cities and by counties, and then of cities as compared with counties, and of cities, counties and the State in their relative significance. A further comparison of ages and of diseases gives still more specific character to these comparisons and the information to be derived therefrom. It is never wise to attach too much importance to a limited or varying death rate which represents less than 10,000 persons, and even this needs to be connected by comparisons by the hundred thousand and by that of the same population in succeeding years.

It is because of the little value of isolated observations over small fields, conducted without symmetry of method, and of the great value of the analyses of assemblages of facts which admit of practical study, that it is so important to gather all the facts in one place and to put them in such form and order as to admit of study and life-saving deduction. Besides the actual work done, it thus becomes possible, at any future time, that provision may be made therefor to derive information on many points of vital and social interest, on which investigation may be deemed desirable.

It is noticeable that, in the last statistical year, the two northern counties of Sussex and Warren had an increase of disease not in accord with their usual experience. Most of the townships show a higher death rate, but the increase has been chiefly owing to localities.

Newton more than doubled its death rate, owing both to typhoid and scarlet fevers and a general increase of disease, which betokens some defects in administration, certainly not in location. Hardyston has suffered much from an epidemic of scarlet fever and from increase in other respects, which tripled the death rate of the former year.

In Warren county, Phillipsburg shows an increase of 35 deaths,

which gives a much increased death rate. Washington township and borough, Hackettstown, Oxford, Harmony and Knowlton nearly doubled their death rates. Although the population of these localities is not compact, it has, in some of them, come our to knowledge that endemics are not properly dealt with by local Boards and that local nuisances exist. Our summary of local reports will give illustration of the different results attending a dilatory and a prompt dealing with such diseases as small-pox, diphtheria, scarlet fever, etc., as well as with general insanitary conditions that tend to foster disease.

For various other particulars and comparisons for various localities, we refer to the tables herewith furnished.

COMMENTS ON SPECIAL DISEASES.

Remittent Fever. This is a disease so rarely fatal and stands for so much in the way of malarial influence that, by numbers, it indicates a larger proportion of sickness and of suspension from labor than any other one disease. The record shows a decrease of about 50 deaths. An examination of localities indicates that, in the northern and middle portions of the State, there has been a very marked decrease, while in some of the southern counties, malaria has been more prevalent. Portions of Burlington, Camden, Cumberland and Ocean counties have suffered much. So long as undrained lands are made worse by obstruction of water-courses, by the building of cities without any preparatory drainage and by various other devices for combining heat, moisture and decaying vegetation, we shall not fail to secure materials which ever and anon will fill the inbreathed air and cause some form of periodic fever. Not only will such places suffer, but occasionally the winds or other favoring conditions will extend the miasm to localities which have good local conditions, and so the people at large come to have an interest in the abatement of such evils to the public health. Our laws, now, well provide for drainage wherever the public sentiment of the people demands it. The interests, both of agriculture and health, are largely promoted thereby. It is encouraging to find that citizens in affected localities are more and more recognizing the relations of saturated soils to malaria, and more care is taken as to ponds and stagnant water. But all this will not avail, until, in certain parts of the State, more extended drainage is conducted under the provisions of the State law.

Typhoid Fever. We have had occasion, in a separate article, to notice three outbreaks of fever, regarded as typhoid and especially connected with foul cesspools. Our reports from time to time give additional instances where one family suffers, or some one part of a city. These cases of local outbreak seldom fail to reveal on the premises a foul cesspool or a contamination of drinking-water, which seems to explain the occasion of the sickness.

The deaths from typhoid fever for the year were 884, as against a record of 499 in the previous year. Cumberland, Essex, Hudson and Passaic show the largest increase, but the gradual advance of the disease in the State must not escape public attention. It is not like malaria or diffused miasm, but a nosocomal or people and house-manufactured disease. Five hundred and twenty-seven of the cases occurred in cities, 310 being the record of the previous year. The most prominent advance was in Jersey city, Newark, Paterson, Camden and Hoboken. One cannot look over the statistical record of the last four years, making due allowance for certain local and institutional death rates, without being convinced that the uniform progress of this disease needs the most careful attention of local authorities. It counts its victims, not among the old—as its occurrence is very rare in those past fifty years of age—children over five and youths and men and women in young and middle life are its victims, while every case of death indicates numbers who have lived after long weeks of suspended labor and often with permanent impairment of vital power. While the question is fairly before the medical profession whether we have not mongrel forms of household and city fever, which differ somewhat from the abdominal typhus or typhoid and yet are fevers of putridity, it is not an open question whether these diseases are not, in their inception, due to the accumulated filth made incident to animal life, or to infiltration of the poison derived from persons who have contracted the disease. It is one of those diseases which are preventible, but can only be prevented by a knowledge of sanitary laws and by their enforcement.

Small-pox. Small-pox presents a record of 367 deaths, as against that of the year previous of 254 and of 15 for the year from July 1st, 1879, to July 1st, 1880. Our record for this year does not include the summer and fall epidemic at Paterson, which was mostly after July 1st. Although there has been this increase—an increase which proper and timely vaccination would wholly have prevented—yet we

are glad to know that the State oversight of the public health has in it been shown to be of very great advantage. Never, since the adoption of vaccination, has the county at large experienced such a widespread small-pox epidemic. New Jersey, as a centre of railroad communication and as exposed to all the risks of immigrant transfer, has had to contend with a great many local outbreaks. Our experience at Camden, the year before, led this Board to put itself in active communication with local Boards of Health, to insist upon early isolation and extended vaccination, and thus enable the local authorities to forestall any great extension of the disease. The law as to school vaccination, passed March 11th, 1880, was very effective as an aid, and school boards availed themselves of its provisions. Much space could be occupied in illustrating by local cases the promptness and efficiency of these Boards, with here and there an equally forcible instance of inadequate power or of a failure to follow the outline of prevention indicated. The summary from the local reports of this year, as given in this report, has some suggestive instances. Physicians as well as the laity have carefully availed themselves of the instructions which have been disseminated by our circulars and by correspondence. The importance of a proper vaccination and the troubles arising from a too disseminated production of lymph have been such as to lead the Board in this report to furnish valuable information from several acknowledged authorities. While the Board does not deem it advisable to ask for the authorization of a State vaccine farm, it does believe that it is not invidious for it to inspect or authenticate the sources from which the lymph is to be derived and to help to protect the people from those risks which have been incurred. Yet, it is to be remembered that so wide-spread a demand is not likely soon again to recur and that the lessons learned are such as almost to assure safe sources of supply. We believe now that every careful physician, who either obtains his supply directly from the producer or cultivates it in human remove, can be as certain as to its purity as he is as to the reliability of any medicine he is called upon to furnish.

Scarlet Fever. Scarlet fever had a marked increase during the winter of 1881–2 and the spring of 1882. The record for the year is 1306 deaths as in contrast with 499 of the previous year and 573 of the year before that. Of this, the greatest excess occurred in Essex, Hudson, Morris, Passaic, Sussex and Warren counties. Eight hundred and twenty-one of the whole number occurred in cities of

over 5000 inhabitants. Two hundred and sixty-eight of the excess of Essex was in Newark; 81 of that of Hudson, in Jersey City; 90 of that of Passaic, in Paterson, while that of Morris, Sussex and Warren counties was mostly in townships.

We are not as familiar with the circumstances which favor the origin of scarlet fever as with those of some other diseases. Yet, as it is more contagious and more fatal when it occurs in ill-kept houses or in close and low districts, we have much control over its spread and virulence. It is a disease easy to limit in its extension if all clothing on the person or in the room of the patient is thoroughly aired, if the skin is well oiled and bathed before mingling with others, and if proper isolation is practiced. We can point to local Boards of Health and to physicians who almost invariably prevent a spread of the disease from one house to another, and often prevent new cases in the same house. It is, we think, spread more by the public schools than in any other way. Children are returned too soon or without proper preparation, to the schools, or pupils attend from the same house during the sickness in it.

Whenever a case of small-pox, scarlet fever, measles or diphtheria occurs in a family, in some way, either the head of the family or the physician should be made responsible that every child from that family (and, often, it must apply to the house) should be prohibited from attendance at school or from mingling with others without a permit. How this shall be accomplished is a matter admitting of discussion more full than can be attempted here. But as to it, we think the following suggestions may be borne in mind:

1. As it is a matter of great public concern and seriously involving human life, it cannot be safely left to the opinions of individuals, but must be regulated by some form of law.

2. Such law, while careful to be as lenient as it ought to be and tolerant of the opinions of others, must rest on the grounds of necessity and social expediency. The law and the courts and the public have their rights of protection from a common carrier of contagion. The judgment of these as expressed in law is even more sacred than the right of private judgment, because it is fully as likely to be based on an unprejudiced view of what the public safety requires.

3. We believe such laws should be flexible to this extent, that the case being properly reported to the proper officer, the physician or head of family may, in some instances, be allowed to agree to take the responsibility of proper isolation and protection. The proper method,

both of regulative law and of securing a correct sentiment among physicians, Health Boards, School Boards and the people, will be discussed more fully at another time.

As scarlet fever is a disease so often fatal, and as it is not apt to be contracted by adults, except where there is some special concentration of the poison, the methods of limiting the disease, both by isolation of the patient and dilution of the poison should be sedulously enforced.

The contagion is not ve:y diffusive. Experiments in hospitals and close observation in single cases seem to show that the disease is very rarely contracted beyond five feet from the patient, if none of the unaired garments or bed-clothing or secretions do not come any nearer than this to others. So if cleanliness of the person and of the room and of the attendant is secured, it is not a very communicable disease. As with it there is much separation of particles from the outside skin, whether of secretion or the epithelial layer itself, oiling and washing, as with a little warm borax-water, are quite efficient in preventing the conveyance of particles to others or to surrounding garments and furniture. In addition, it is the belief of many that potassium chloride, weak solutions of ferrum chloride, sulphur, etc., applied to the mouth and throat beforehand, are apt to prevent the absorption of the poison.

Measles. The record shows for the State 206 cases of death by measles, in place of 70 and 87 the two previous years, respectively. Of these, 156 cases were within city limits. This occurs, not because the disease is so much severer in cities, but chiefly from the greater density of population. This number of deaths stands for a great number of cases. The disease was epidemic in many parts of the State. It is unfortunate that it often leaves enfeeblement of lung tissue or some impairment of perfect respiration. Colds, bronchitis, pleurisy and consumption are too frequent sequelæ. Next to small-pox, it is the most communicable of the zymotic diseases; so much so, that in mild epidemics and in favorable seasons of the year, some parents deem it wise to take no special precautions to protect their children from exposure. It often occurs almost with regularity at periods between five to seven years, because these are the ages at which young children most generally make their first appearance at school or where there can be more general exposures. Yet, the disease is one in which preventive and mitigating measures are very important. Evenness of temperature, protection from cold winds and not too early return to school or other duties are very important.

Whooping Cough. Whooping cough is, at times, quite a fatal disease in England and sometimes shows much severity in damp and variable climates here. The colder months of 1882 and 1883 showed the unusual mortality of 253 against 119 of the year before. For the last three years it has had a higher range of mortality in this State than measles. This is in part because it is so seldom submitted to hygienic care or medical treatment in the earlier stages. Also, as it has both nervous and pulmonary irritations, it often causes diseases of the reflex nervous system or invades both systems of nerve life. Its spasmodic character and its tendency to congest the small vessels of the lungs, often need early attention. Warm clothing, protection from draughts and an equable temperature have much influence over it. There is reason to believe that the contagion is spread by the sputa and sometimes by the dried mucus which becomes mingled with floating particles in the atmosphere of rooms.

Croup and Diphtheria. In recent years, these have so prominently and fatally added to the diseases of childhood as to command our most inquisitive attention. While the disease is more manageable than formerly, it is not less virulent in some of its localized outbreaks.

The increase from 873 in 1879–80 to 1728 in 1880–81 and 1472 in 1881–82 well deserves a most careful study. One thousand and fifty-one of these cases were in cities. As the cities of over 5000 inhabitants represent just about one-half of the population of the State, (576,950,) this proportion does not confirm the somewhat prevalent idea that the disease exists as much in the country as in cities. Local outbreaks in the country seem to be equally virulent, and too often we have to record several of a family group as swept off by this virulent disease. But it is not so often transmitted from one to another as in cities, since we have come to know more as to the importance of isolation. While the particle of contagion is obscure, the connection of its fatal fertility with filth, bad air, household accumulation and stagnant dampness cannot be doubted. It may fall or grow amid other soil, but these are its forcing-places.

Two notable instances in this State connect it with cesspool filth. In both of these—the one in Montclair and the other in Chambersburg—it occurred soon after the free spreading of cesspool deposit over grass-plots, and in both instances, seized the nearest family group, when the disease did not prevail in the vicinity. Sudden changes of atmosphere have much to do with outbreaks of the disease at points where its substance and its soil have been provided.

Hygiene has largely to do with its prevention and not less with the milding of the cases and the limiting of its spread when it occurs. It is ever apparent that good physicians often save the members of the family who are taken four or five days after their visit to the one first stricken, because they are able to modify the type, to dilute the contagion and to restrain its virulence. This is done not less by the hygienic than by the medical treatment. We refer for its more extended consideration to the Fourth Report of this Board, (1880,) pages 7–13, and to various articles on modes of disinfection as contained in the State reports.

Diarrheal Diseases. The record of 2792 deaths, as an increase over the 2255 and 2166 of 1880–81 and 1879–80, is a very significant record of the summer drought of 1881, and is the analogue of the pulmonary diseases which marked the previous winter. All but 95 of these cases were in persons under twenty—as most cases of adult disorder of this kind are classified with the diseases of the digestive and intestinal track. Besides, many who die under one month are returned as from this cause, but are not added to this tabulation. Of these, 1814 died in cities. While excessive heat determines the fact of a high death rate from this cause with children, it is chiefly children of two classes that suffer—those that are dependent solely on cow's milk or other artificial food, and those who, by neglect or promiscuous feeding or by dwelling amid impure surroundings, are exposed to insanitary influences. Impure water, poor milk, ill-prepared food and foul air affect the intestinal canal much oftener than they give rise to specific forms of fever. The children of the laboring classes suffer much from too frequent piece-meal systems of feeding and from bad cookery. Foods otherwise digestible thus come to be irritants and cause serious derangement of the stomach and bowels. The tax of this kind of sickness is so great upon industrial life that social science and political economists have deemed it worthy of their notice. Both in New York City and Philadelphia much good has been done by a series of hygienic directions to mothers and by a system of summer sanitary inspection. Many of the children who are sacrificed by these summer diseases are not naturally very delicate, and die as the direct result of outside causes. Bereavements to the family thus too often become bereavements to the State.

Consumption and Acute Lung Diseases. The havoc which this

great destroyer of mankind makes in our own State was pointed out and its causes discussed in a special article in our last report. Three thousand, four hundred and seventy-five deaths occurred from this cause instead of 2989, as in the previous year. Of these, 2102 were in cities of over 5000 inhabitants. Our office records show that in the cities the excess of deaths among females was 20, and in the country, 83.

The large city rate is very informatory as to the influence of foul air and city dampness. While the disease is seldom checked when fully developed, the advance of pathology shows how frequently it is an induced disease.

In connection therewith, acute lung diseases also need to be noticed. Two thousand seven hundred and fifty-two deaths occurred from these, or an increase of 544 from the former year—very nearly the same increase as from consumption. Of these, 1741 were in cities, showing also nearly the same relative increase. While many causes are at work to produce the various forms of lung disease, either acute or chronic, the most careful observers and students of statistics have not failed to recognize the paramount influence of impure air and moist conditions of soil, in which the exchanges between earth and air are artificially embarassed. While in the city the first factor is the most prominent, yet, the undrained land of some country districts is fully offset by the high level of ground water and the mingling of stagnant water and stagnant decaying material in the uncropped soil of our cities—uncropped saved as it is diverted from the support of vegetable to the destruction of the higher animal life.

Brain and Nervous Diseases of Children. The record of increase is not so excessive with these, although 357 more for the State than the previous year. Of the 1999 deaths from this cause, 1364 occurred in cities of over 5000 inhabitants, whereas the relative share would have been about 1000.

So many influences tend to enfeeble the brain and nervous system, to overtax it or to subject it too early to tobacco or other toxics, that it is very difficult to single out each factor and affirm its relative significance. There can be no doubt that we need to study in the interests of population that nervous irritability which is so often early manifest and to guard against that class of degenerative changes which is, of all others, most disastrous in its effect on life.

There are some questions as to early discipline, both in the home

and in the school, that may well be started or that start themselves and need careful analysis and reply. It is not alone that there is over-cramming, but the sins of omission are greater than those of commission. Bodily training, habit-teaching and healthy discipline seem to have vanished as systems. They are talked about, they are patronized, but they find little place in the care of infant and of school life. The care of childhood as something to be aided and directed and drilled in harmonious physical development must have fuller recognition if we would have a diminution of those brain and nervous diseases of children which now sum up so large a number in the causes of fatality.

Other Diseases. After so many notices of increased mortality, it is pleasant, as we come to such adult diseases as those of the heart and circulation, to urinary diseases, to adult brain diseases, erysipelas, digestive and intestinal diseases, and cancers, to find no marked increase.

Acute rheumatism has been less frequent. Puerperal diseases show a favorable diminution. It thus appears that it is life before adult age that has chiefly suffered—a fact, the contrast of which points very plainly to most of the causes of the increased mortality as artificial.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS, BY TOWNSHIPS.

Atlantic County.

	M.	B.	D.
Absecon	5	10	14
Atlantic City	45	90	174
Buena Vista	....	17	10
Egg Harbor City	18	34	33
Egg Harbor Township	26	66	65
Galloway	6	39	41
Hamilton	9	39	29
Hammonton	21	45	27
Mullica	3	5	6
Weymouth	1	17	9
	134	362	408

Bergen County.

	M.	B.	D.
Englewood	25	28	64
Franklin	13	54	41
Harrington	16	28	25
Hohokus	20	58	28
Lodi	13	107	82
Midland	9	19	34
New Barbadoes	57	113	104
Palisade	12	36	26
Ridgefield	17	61	88
Ridgewood	13	34	31
Saddle River	3	18	21
Union	14	67	65
Washington	11	43	40
	223	666	649

Burlington County.

	M.	B.	D.
Bass River	3	31	23
Beverly	13	14	54
Bordentown	47	107	90
Burlington	59	83	166
Chester	29	71	36
Chesterfield	12	31	27
Cinnaminson	14	44	38
Delran	8	10	22
Evesham	12	39	31
Eastampton	1	10	9
Florence	8	30	18
Little Egg Harbor	13	39	34
Lumberton	....	12	12
Mansfield	9	39	17
Medford	11	33	30
Mt. Laurel	2	20	19
New Hanover	28	46	38
Northampton	53	88	97
Pemberton	19	47	65
Randolph	3	9	9
Shamong	8	17	16
Southampton	17	37	29
Springfield	6	40	28
Washington	1	7	11
Westampton	1	18	6
Willingboro	2	15	20
Woodland	....	2	3
	374	939	948

Camden County.

	M.	B.	D.
Camden	443	696	1023
Centre	3	41	25
Delaware	....	23	25
Gloucester City	39	159	98
Gloucester	10	61	61
Haddon	19	73	51
Stockton	14	52	58
Waterford	10	29	24
Winslow	5	52	41
	543	1186	1406

Cape May County.

	M.	B.	D.
Cape May City	24	42	24
Dennis	13	43	31
Lower	6	53	29
Middle	11	46	22
Upper	11	43	28
	65	227	134

Cumberland County.

	M.	B.	D.
Bridgeton	118	219	208
Commercial	12	28	41
Deerfield	12	24	15
Downe	16	28	24
Fairfield	17	85	41
Greenwich	11	20	16
Hopewell	10	31	31
Landis	66	130	106
Maurice River	15	50	48
Millville	100	266	136
Stoe Creek	8	32	21
	385	913	687

Essex County.

	M.	B.	D.
Belleville	19	77	64
Bloomfield	37	125	83
Caldwell	20	57	45
Clinton	19	42	39
East Orange	25	193	113
Franklin	13	20	31
Livingston	10	16	19
Millburn	23	33	32
Montclair	26	126	101
Newark	1353	3646	3925
Orange	125	417	337
South Orange	22	83	69
West Orange	11	64	67
	1703	4899	4925

Gloucester County.

	M.	B.	D.
Clayton	25	39	33
Deptford	1	38	22
East Greenwich	6	31	20
Franklin	11	65	34
Glassboro	14	77	65
Greenwich	6	32	25
Harrison	15	43	53
Logan	9	29	20
Mantua	15	42	28
Monroe	8	50	26
Washington	13	31	31
West Deptford	....	34	23
Woodbury	30	58	47
Woolwich	16	57	44
	169	626	471

Hudson County.

	M.	B.	D.
Bayonne	61	161	253
Guttenberg	8	24	33
Harrison	6	148	172
Hoboken	330	695	976
Jersey City	826	1288	3646
Kearney	4	24	36
North Bergen	7	48	317
Town of Union	65	150	216
Union	4	18	34
Weehawken	1	13	40
West Hoboken	30	140	138
	1342	2709	5861

Hunterdon County.

	M.	B.	D.
Alexandria	6	20	22
Bethlehem	15	46	55
Clinton township	4	26	37
Delaware	15	43	40
East Amwell	12	29	26
Franklin	14	21	9
Frenchtown	11	12	22
High Bridge	14	49	36
Holland	8	38	18
Kingwood	8	32	18
Lambertville	38	71	69
Lebanon	19	55	47
Raritan	19	66	54
Readington	16	58	52
Tewksbury	23	43	27
Town of Clinton	14	17	10
Union	3	12	14
West Amwell	3	12	14
	242	650	570

Mercer County.

	M.	B.	D.
Chambersburg	31	149	138
East Windsor	21	29	41
Ewing	8	21	85
Hamilton	11	46	78
Hopewell	32	59	77
Lawrence	10	41	55
Millham	2	27	3
Princeton	29	99	85
Trenton	344	588	615
Washington	2	19	17
West Windsor	9	15	18
	499	1093	1212

Middlesex County.

	M.	B.	D.
Cranbury	13	37	29
East Brunswick	30	73	69
Madison	2	18	20
Monroe	25	37	42
New Brunswick	178	405	390
North Brunswick	8	27	20
Perth Amboy	75	190	135
Piscataway	16	62	54
Raritan	16	65	59
Sayreville	14	26	22
South Amboy	30	71	89
South Brunswick	5	40	41
Woodbridge	11	78	85
	423	1129	1055

Monmouth County.

	M.	B.	D.
Atlantic	9	24	31
Eatontown	13	22	44
Freehold	49	71	80
Holmdel	1	25	16
Howell	23	72	64
Manalapan	16	46	27
Marlboro	11	29	27
Matawan	22	34	72
Middletown	31	73	83
Millstone	18	33	27
Neptune	53	125	176
Ocean	47	165	147
Raritan	41	85	81
Shrewsbury	44	127	128
Upper Freehold	28	48	60
Wall	39	140	86
	445	1119	1149

Morris County.

	M.	B.	D.
Boonton	25	67	53
Chatham	16	49	86
Chester	10	59	47
Hanover	15	56	125
Jefferson	9	19	26
Mendham	17	38	24
Montville	14	20	39
Morristown	29	104	121
Mount Olive	11	51	36
Passaic	8	35	30
Pequannock	7	39	54
Randolph	67	171	146
Rockaway	49	131	145
Roxbury	20	47	33
Washington	11	73	34
	308	959	999

Ocean County.

	M.	B.	D.
Berkeley	2	17	9
Brick	14	55	36
Dover	20	64	33
Eaglewood	7	13	15
Jackson	7	38	17
Lacey	5	20	16
Manchester	6	31	18
Ocean	2	10	11
Plumsted	6	40	28
Stafford	7	8	19
Union	8	25	18
	84	321	220

Passaic County.

	M.	B.	D.
Acquackanonk	3	30	21
Little Falls	15	30	39
Manchester	2	12	21
Passaic	71	214	149
Paterson	568	1517	1512
Pompton	29	35	47
Wayne	3	9	17
West Milford	24	48	45
	715	1895	1851

Salem County.

	M.	B.	D.
Elsinboro	....	7	5
Lower Alloways Creek	9	20	13
Lower Penn's Neck	4	19	24
Mannington	1	40	60
Oldmans	3	26	17
Pilesgrove	33	64	69
Pittsgrove	11	44	41
Quinton	....	36	20
Salem	51	110	98
Upper Alloways Creek	11	35	30
Upper Penn's Neck	17	43	43
Upper Pittsgrove	10	30	36
	150	474	456

Somerset County.

	M.	B.	D.
Bedminster	12	22	40
Bernards	14	55	47
Branchburg	4	32	24
Bridgewater	74	170	154
Franklin	21	47	73
Hillsborough	17	45	52
Montgomery	6	34	28
North Plainfield	11	67	60
Warren	5	17	26
	164	489	504

Sussex County.

	M.	B.	D.
Andover	11	15	29
Byram	15	17	24
Frankford	6	27	26
Greene	....	16	4
Hardyston	12	9	70
Hampton	14	14	13
Lafayette	18	3	18
Montague	4	6	15
Newton	25	38	66
Sandyston	8	21	23
Sparta	15	30	44
Stillwater	14	23	39
Vernon	12	17	30
Walpack	3	8	4
Wantage	22	43	54
	179	287	459

Union County.

	M.	B.	D.
Clark	1	5	9
Cranford	....	10	10
Elizabeth	269	813	612
Fanwood	5	15	17
Linden	4	23	38
New Providence	2	18	21
Plainfield	67	146	151
Rahway	51	96	183
Springfield	4	17	10
Summit	10	41	41
Union	8	33	27
Westfield	10	41	58
	431	1258	1177

Warren County.

	M.	B.	D.
Alamuchy	....	17	14
Belvidere	14	32	34
Blairstown	13	49	28
Franklin	18	31	30
Frelinghuysen	6	21	6
Greenwich	21	43	51
Hackettstown	23	61	58
Hardwick	....	6	7
Harmony	6	37	31
Hope	9	34	35
Independence	5	21	16
Knowlton	10	31	38
Lopatcong	4	42	30
Mansfield	8	12	50
Oxford	25	125	112
Pahaquarry	....	8	1
Phillipsburg	64	243	169
Pohatcong	2	9	12
Town of Washington	27	64	64
Washington	4	21	32
	259	907	818

Totals of Marriages, Births and Deaths for all the Counties.

	M.	B.	D.
Atlantic	134	362	408
Bergen	223	666	649
Burlington	374	939	948
Camden	543	1186	1406
Cape May	65	227	134
Cumberland	385	913	687
Essex	1703	4899	4925
Gloucester	169	626	471
Hudson	1342	2709	5861
Hunterdon	242	650	570
Mercer	499	1093	1212
Middlesex	423	1129	1055
Monmouth	445	1119	1149
Morris	308	959	999
Ocean	84	321	220
Passaic	715	1895	1851
Salem	150	474	456
Somerset	164	489	504
Sussex	179	287	459
Union	431	1258	1177
Warren	259	907	818
	8837	23,108	25,959

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefi'ed.	Population, census of 1880.*	Death rate per 1,000.
Atlantic	114	61	23	102	102	4	406	18,704	21.71
Bergen	119	122	67	180	153	8	649	36,786	17.64
Burlington	189	118	89	248	297	12	948	55,403	17.11
Camden	335	213	145	397	251	13	1,404	62,942	22.30
Cape May	29	15	15	33	39	4	134	9,765	13.72
Cumberland	128	118	82	169	185	8	690	37,687	18.31
Essex	1,107	1,154	578	1,356	717	19	4,911	189,929	25.85
Gloucester	125	44	41	129	129	3	471	25,886	18.19
Hudson	1,456	1,229	712	1,789	642	10	5,840	187,944	31.07
Hunterdon	103	41	40	136	244	6	570	38,570	14.77
Mercer	265	145	102	405	268	29	1,209	58,061	20.82
Middlesex	238	151	118	311	231	11	1,066	52,286	20.18
Monmouth	250	129	106	337	306	26	1,153	55,538	20.76
Morris	177	147	128	302	235	10	999	50,861	19.64
Ocean	55	16	18	79	48	3	219	14,455	15.15
Passaic	500	322	197	540	284	4	1,847	68,860	26.82
Salem	91	64	50	104	137	9	455	24,579	18.51
Somerset	99	52	64	129	155	5	504	27,162	18.55
Sussex	63	78	54	116	186	14	455	23,539	19.33
Union	265	223	130	318	236	5	1,177	55,571	21.18
Warren	174	146	132	178	174	10	814	36,589	22.24
Totals	5,984	4,578	2,886	7,337	4,963	212	25,910	1,131,117	22.90

COUNTIES. Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.
Atlantic	....	13	2	10	2	14	12	66	26	33
Bergen	16	19	6	35	2	2	20	66	55	33
Burlington	17	40	3	11	7	11	29	99	66	84
Camden	33	65	3	40	2	11	48	194	81	105
Cape May	2	10	....	2	2	....	....	9	10	9
Cumberland	2	55	....	8	....	7	64	64	50	57
Essex	58	112	19	401	64	62	401	474	356	319
Gloucester	5	21	5	9	....	8	11	61	33	43
Hudson	86	235	277	266	70	42	443	680	381	388
Hunterdon	9	24	1	15	3	6	6	47	26	35
Mercer	18	37	19	10	11	11	43	128	115	102
Middlesex	15	33	11	43	1	8	45	110	57	80
Monmouth	9	24	5	40	3	11	33	130	66	72
Morris	21	26	....	86	1	7	50	76	52	63
Ocean	....	10	....	1	1	2	18	16	19	29
Passaic	30	61	3	134	3	14	53	269	123	126
Salem	5	22	....	7	1	13	27	30	39	42
Somerset	16	12	....	10	6	3	23	42	17	33
Sussex	9	17	....	44	2	....	26	32	21	26
Union	24	21	3	72	20	15	63	114	70	86
Warren	9	27	10	62	5	6	62	85	33	48
Totals	379	384	367	1306	206	253	1473	2793	1696	1779

COUNTIES. Statistical Divisions.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	32	22	26	13	33	....	11	8	....	4	6
Bergen	35	54	37	15	29	1	15	12	1	10	27
Burlington	101	50	49	31	78	5	21	21	....	9	30
Camden	139	110	51	39	88	2	23	28	1	16	32
Cape May	11	12	5	3	11	....	1	4	....	1	4
Cumberland	42	56	33	22	47	3	26	4	1	6	19
Essex	561	457	189	180	242	12	118	76	7	44	94
Gloucester	48	32	26	10	28	1	13	8	1	6	18
Hudson	639	528	198	131	210	18	141	53	8	49	225
Hunterdon	54	23	56	26	65	4	14	20	2	8	21
Mercer	119	62	52	26	109	10	36	23	3	5	37
Middlesex	104	64	45	33	61	4	33	223	5	10	50
Monmouth	113	65	76	51	114	4	43	19	5	5	41
Morris	120	61	57	33	88	1	36	15	2	10	33
Ocean	16	19	12	1	13	1	10	3	3	3	2
Passaic	205	136	73	58	74	7	75	23	6	16	45
Salem	39	20	26	6	36	3	17	13	1	4	3
Somerset	53	34	41	19	51	6	34	10	1	9	19
Sussex	33	23	33	21	27	3	22	8	....	7	16
Union	137	112	55	26	57	4	81	24	1	12	48
Warren	78	58	42	14	56	5	21	9	4	10	18
Totals	2752	1,999	1,181	765	1,531	94	740	403	52	244	798

Death-rate per 1,000 from these diseases, exclusive of accidents, 18.41. Note that consumption has two columns.

* On page 317, 5th Report, "1875" should be "1880," and the addition of diarrheal diseases, page 316, is 2,305.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

CITIES HAVING OVER 5,000 POPULATION. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Atlantic County.									
Atlantic City	58	34	10	41	31	....	174	5,477	31.76
Burlington County.									
Bordentown..........	10	16	5	34	24	1	90	5,334	16.88
Burlington...........	24	16	23	48	51	4	166	7,237	22.94
Camden County.									
Camden	234	166	118	291	156	18	1,023	41,659	24.55
Gloucester City.......	29	10	11	30	18	....	98	5,347	18.33
Cumberland County.									
Bridgeton	37	39	35	47	45	5	208	8,722	23.85
Millville.............	25	22	24	41	23	1	136	7,660	17.75
Essex County.									
Newark	871	959	448	1,096	522	16	3,912	136,508	28.66
Orange...............	83	65	44	84	59	1	336	13,207	25.44
Hudson County.									
Bayonne..............	78	63	25	74	18	....	258	9,872	26.89
Harrison	35	35	19	63	17	1	170	6,898	24.61
Hoboken	264	223	108	286	93	....	974	30,999	31.42
Jersey City...........	908	774	450	1,121	377	6	3,636	120,722	30.12
Union	59	55	40	43	19	....	216	5,849	36.93
Mercer County.									
Chambersburg	48	21	19	27	18	3	136	5,437	25.01
Trenton..............	141	76	53	216	107	21	614	29,910	20.53
Middlesex County.									
New Brunswick......	93	57	49	113	75	4	391	17,166	22.78
Morris County.									
Morristown...........	22	15	18	41	24	1	121	6,837	17.70
Passaic County.									
Passaic..............	47	28	17	32	24	1	149	6,532	22.82
Paterson	417	260	150	463	221	....	1,511	51,031	29.61
Salem County.									
Salem	19	11	10	26	32	2	99	5,056	19.58
Union County.									
Elizabeth............	148	131	74	165	91	3	612	28,229	21.68
Plainfield............	34	20	20	30	47	....	151	8,126	18.58
Rahway..............	33	37	22	46	45	....	183	6,455	28.35
Warren County.									
Phillipsburg.........	54	34	21	34	26	....	169	7,181	23.53
Totals	3,517	3,186	1,808	4,490	3,148	98	15,397	576,960	26.71

Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal Diseases.	Consumption. M.	Consumption. F.	Acute lung Diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic City	....	5	....	5	....	3	6	37	8	12	13	11	11	7	14	....	3	4	....	1	4
Bordentown	2	1	1	1	....	1	7	6	7	7	6	6	9	4	11	1	......	2	....	....	3
Burlington	5	3	....	1	....	....	11	15	17	19	13	3	11	7	13	....	3	4	....	1	4
Camden	27	50	2	37	2	7	38	142	57	64	105	80	35	32	54	1	14	26	1	12	36
Gloucester City	1	6	....	....	....	....	2	12	7	9	9	9	1	3	9	1	......	1	....	....	2
Bridgeton	2	18	....	1	....	2	43	14	14	12	15	18	10	4	11	1	7	1	....	1	10
Millville	....	25	....	1	....	....	3	19	8	15	6	12	3	6	7	....	4	....	....	2	3
Newark	42	97	19	310	60	47	309	374	289	262	490	377	151	138	189	10	81	58	6	32	76
Orange	2	5	....	28	....	8	37	34	27	17	36	35	12	11	12	1	6	5	....	7	6
Bayonne	5	9	....	11	1	1	18	31	8	12	50	26	4	7	9	....	8	1	....	2	16
Harrison	7	6	....	10	1	3	8	16	17	13	23	25	5	3	4	....	3	1	2	1	4
Hoboken	13	27	26	41	5	3	118	131	68	59	91	96	40	34	24	2	11	10	1	11	32
Jersey City	35	156	209	165	58	26	224	417	221	213	418	311	120	61	187	15	106	37	4	29	147
Union	2	3	4	14	1	....	47	28	9	10	10	31	8	6	6	....	5	2	....	3	3
Chambersburg	2	6	....	4	....	4	8	21	7	8	22	9	5	1	5	....	5	1	....	....	2
Trenton	8	20	17	....	5	3	21	75	59	67	69	32	26	14	29	5	12	9	3	1	22
New Brunswick	6	12	9	20	....	4	14	46	20	37	36	30	14	15	17	3	11	12	1	1	12
Morristown	2	....	....	3	....	....	3	15	12	10	9	9	7	5	8	....	9	4	1	....	4
Passaic	3	9	....	6	....	4	3	24	5	18	12	15	7	4	6	1	3	....	....	2	7
Paterson	24	49	3	101	3	10	37	232	106	112	178	108	57	51	52	6	63	19	5	12	31
Salem	3	5	....	1	....	....	2	6	8	12	7	7	4	2	9	....	......	6	....	1	1
Elizabeth	18	7	....	41	10	6	36	65	33	39	56	70	28	10	32	....	13	11	1	4	30
Plainfield	....	2	....	5	7	....	10	17	5	17	23	9	6	7	10	1	3	3	....	....	3
Rahway	1	5	3	15	3	2	10	13	9	11	36	15	14	4	8	2	7	3	....	1	3
Phillipsburg	9	6	....	....	....	3	26	24	15	6	13	18	11	1	10	....	3	1	....	2	1
Totals	207	537	298	861	156	142	1086	1814	1041	1061	1741	1,364	598	457	666	50	379	230	26	126	457

Death-rate per 1,000 from these diseases, exclusive of accidents, 23.35.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

ATLANTIC COUNTY. Population ..... 18,704. Statistical Divisions.	DEATH AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Absecon	4	3	1	3	2	1	14	507	....	....	....	....	1	....	....	2	2	1	1	....	2	2	....	1	....	....	....	....	....	1
Atlantic City	58	34	10	41	31	....	174	5,477	31.76	....	5	....	5	....	3	6	37	8	12	13	11	11	7	14	....	3	4	....	1	4
Buena Vista	1	1	2	3	3	....	10	885	....	....	1	....	....	1	....	....	....	1	....	2	....	1	....	2	....	....	....	....	....	....
Egg Harbor City	5	3	....	8	17	....	33	1,232	....	....	....	....	....	....	2	1	3	2	4	3	....	3	....	7	....	1	1	....	1	....
Egg Harbor Township	20	7	3	17	15	1	63	3,563	....	....	4	1	3	....	1	....	10	4	3	5	5	3	2	5	....	3	1	....	....	1
Galloway	9	3	3	12	14	....	41	2,337	....	....	....	....	1	....	2	2	1	6	5	4	1	2	1	4	....	2	2	....	1	....
Hamilton	9	8	2	2	6	2	29	1,464	....	....	....	....	....	1	5	1	8	....	2	3	2	1	1	2	....	....	....	....	....	....
Hammonton	5	1	1	13	7	....	27	1,776	....	....	1	1	....	....	1	....	2	3	5	1	1	1	2	1	....	2	....	....	1	....
Mullica	1	....	1	2	2	....	6	717	....	....	1	....	....	....	....	....	1	....	....	1	....	1	....	....	....	....	....	....	....	....
Weymouth	2	1	....	1	5	....	9	741	....	....	1	....	....	....	....	....	2	....	1	....	....	1	....	2	....	....	....	....	....	....
Totals	114	61	23	102	102	4	406	18,704	21.71	....	13	2	10	2	14	12	66	25	33	32	22	26	13	38	....	11	8	....	4	6

Death-rate per 1,000, without cities of over 5,000, 17.55. Death-rate of Atlantic City includes a very large summer population.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

BERGEN COUNTY. Population .... 86,786. Statistical Divisions.	DEATH AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Englewood	14	15	4	21	5	5	64	4,076	......	2	1	....	....	....	....	1	11	6	1	6	10	10	1	....	....	1	8	....	2	....
Franklin	6	11	2	10	12	....	41	2,206	......	1	1	....	4	....	....	2	7	2	4	5	1	6	2	....	....	1	....	....	....	....
Harrington	2	4	4	8	7	....	25	2,570	......	....	1	....	4	....	....	....	1	1	2	2	1	2	....	1	....	1	....	....	....	2
Hohokus	8	3	2	5	10	....	28	2,920	......	....	....	....	....	....	....	....	5	4	2	5	....	2	3	1	....	....	....	....	1	....
Lodi	19	13	10	24	14	2	82	4,071	......	....	3	2	1	....	1	2	4	11	3	15	10	2	1	3	....	1	2	....	2	3
Midland	5	3	....	15	10	1	34	1,591	......	2	1	....	3	....	....	....	....	3	1	3	....	1	1	4	....	1	....	....	2	1
New Barbadoes	17	18	18	28	33	....	104	4,248	......	2	1	....	5	....	1	9	5	6	4	15	11	4	3	5	....	3	4	....	2	7
Palisade	4	5	4	7	6	....	26	2,302	......	....	....	....	2	....	....	....	5	1	3	3	2	1	....	1	....	4	....	....	....	....
Ridgefield	17	21	10	27	13	....	88	3,952	......	2	3	2	9	2	....	3	12	6	5	11	7	4	....	3	....	2	3	1	....	5
Ridgewood	4	7	5	9	6	....	31	1,478	......	2	2	....	3	....	....	....	2	6	3	4	2	....	....	2	....	....	....	....	....	2
Saddle River	3	3	2	6	7	....	21	1,355	......	....	1	....	2	....	....	....	....	....	2	4	1	1	2	2	....	....	....	....	....	1
Union	14	17	8	14	12	....	65	3,164	......	3	4	2	2	....	....	3	11	3	2	7	7	2	....	3	1	1	....	....	....	5
Washington	6	2	3	11	18	....	40	2,853	......	2	1	....	....	....	....	....	3	6	6	5	2	2	2	1	....	....	....	....	1	1
Totals	119	[illegible]	67	180	158	8	649	86,786	17.64	16	19	6	35	2	2	20	66	55	33	85	54	37	15	29	1	15	12	1	10	27

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

BURLINGTON COUNTY.

Population........55,408

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bass River	4	3	3	5	7	1	23	1,046	......	....	1	....	....	....	1	....	4	1	3	4	1	....	1	4	....	....	....	....	....	1
Beverly City	6	2	3	8	7	1	27	1,759	......	....	....	....	1	....	....	....	4	3	5	1	....	1	1	1	....	1	....	....	....	1
Beverly Township	3	3	4	4	13	....	27	1,369	......	....	1	....	....	....	....	1	2	3	2	4	2	1	....	1	....	....	1	....	....	1
Bordentown	10	16	5	34	24	1	90	5,334	16.88	2	1	1	1	....	1	7	6	7	7	6	8	9	4	11	1	....	2	....	....	3
Burlington	24	16	23	4[illegible]	51	4	165	7,237	22.94	5	3	....	1	....	....	11	15	17	19	13	3	11	7	13	....	3	4	....	1	4
Chester	7	2	....	8	18	1	36	2,856	......	1	....	....	....	....	....	....	4	1	1	4	2	....	3	6	....	2	2	....	1	....
Chesterfield	4	1	2	8	12	....	27	1,525	......	1	....	....	1	....	....	....	....	3	....	4	1	....	1	3	....	....	1	....	....	1
Cinnaminson	9	4	4	9	12	....	38	2,184	......	....	4	....	....	....	....	1	3	3	3	9	1	3	1	1	....	....	....	....	....	1
Delran	3	4	2	9	4	....	22	1,760	......	3	4	2	1	....	....	....	2	....	2	....	....	1	2	....	....	....	....	....	1	1
Evesham	8	3	5	5	10	....	31	1,602	......	....	2	....	1	....	....	....	5	3	2	5	5	3	1	1	....	1	1	....	....	....
Eastampton	4	....	3	1	1	....	9	566	......	....	....	....	....	....	....	....	1	....	1	....	1	....	....	1	....	....	....	....	....	1
Florence	2	6	1	4	5	....	18	1,528	......	1	....	....	....	....	....	1	2	....	1	2	1	....	1	2	1	....	....	....	....	2
Little Egg Harbor	8	4	1	5	16	....	34	1,881	......	....	1	....	....	....	....	1	5	2	2	2	4	1	1	4	....	1	....	....	....	1
Lumberton	1	3	....	6	2	....	12	1,689	......	....	1	....	....	....	....	1	1	2	....	1	1	1	....	....	....	1	....	....	....	1
Mansfield	9	....	1	5	2	....	17	1,648	......	....	4	....	....	....	1	....	5	....	....	1	....	....	....	1	....	....	2	....	....	....
Medford	6	5	1	7	11	....	30	1,980	......	....	....	....	....	....	1	3	....	1	4	7	1	1	3	1	....	1	4	....	....	1
Mount Laurel	7	2	1	5	4	....	19	1,739	......	....	....	....	....	....	....	....	4	....	4	1	2	1	....	1	....	....	....	....	....	....
New Hanover	9	4	6	6	13	....	38	2,373	......	....	3	....	....	....	2	....	3	2	5	4	2	5	1	2	1	2	....	....	1	....
Northampton	23	8	11	17	36	2	97	4,630	......	2	2	....	....	3	2	1	11	5	8	8	7	7	1	11	....	3	2	....	2	3
Pemberton	14	4	5	20	21	1	65	2,885	......	1	6	....	1	2	1	....	6	6	5	7	2	2	3	5	1	2	....	....	1	3
Randolph	2	2	1	3	1	....	9	428	......	....	1	....	....	....	....	2	1	....	1	1	1	....	....	1	....	1	....	....	....	....
Shamong	7	1	1	4	3	....	16	1,097	......	....	....	....	....	....	....	....	4	....	2	3	1	....	....	....	....	1	2	....	1	....
Southampton	2	3	1	13	10	....	29	2,369	......	....	2	....	1	1	....	....	1	4	4	3	1	2	....	2	....	1	....	....	....	1
Springfield	5	8	2	5	8	....	28	1,886	......	....	2	....	1	1	1	....	3	1	....	3	3	....	....	3	1	1	....	....	....	2
Washington	4	3	....	3	1	....	11	389	......	....	1	....	....	....	....	....	2	....	2	4	....	....	....	....	....	....	....	....	....	1
Westampton	1	2	....	1	2	....	6	715	......	....	....	....	....	....	....	....	3	....	....	1	....	....	....	2	....	....	....	....	....	....
Willingboro	6	4	3	3	3	1	20	743	......	1	1	....	2	....	1	....	2	1	....	3	....	....	....	1	....	....	....	....	1	1
Woodland	1	....	....	2	....	....	3	326	......	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....
Totals	189	113	89	248	297	12	948	55,408	17.11	17	40	3	11	7	11	29	99	66	84	101	50	49	31	78	5	21	21	....	9	30

Death-rate per 1,000 in counties without cities of over 5,000 population, 16.16.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

CAMDEN COUNTY.

Population..........62,942

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Camden City	284	166	113	291	156	18	1022	41,659	24.55	27	50	2	37	2	7	38	142	57	64	106	80	35	32	54	1	14	25	1	12	26
Centre	6	5	1	4	9	....	25	1,532	......	....	....	....	....	....	....	....	3	2	3	2	5	3	1	1	....	1	....	....	....	....
Delaware	6	2	....	10	7	....	25	1,481	......	....	2	....	....	....	....	....	6	1	4	1	....	1	....	4	....	1	....	....	....	....
Gloucester Township	16	6	5	16	17	....	60	2,527	......	1	2	....	2	....	1	....	8	7	4	5	5	2	....	8	....	1	....	....	....	1
Gloucester City	29	10	11	30	18	....	98	5,347	18.33	1	6	....	....	....	....	2	12	7	9	9	9	1	3	9	1	....	1	....	....	2
Haddon	11	7	1	13	19	....	51	2,551	......	2	....	....	....	....	1	1	4	3	6	5	2	5	1	4	....	1	1	....	3	1
Stockton	19	8	8	14	8	....	57	3,532	......	2	3	1	....	....	1	1	10	2	7	4	6	....	2	3	....	1	1	....	....	1
Waterford	7	4	4	4	5	....	24	2,149	......	....	1	....	1	....	....	5	3	....	2	2	2	....	....	3	....	2	....	....	....	....
Winslow	7	5	2	15	12	....	41	2,158	......	....	1	....	....	....	1	1	6	2	7	6	1	4	....	2	....	2	....	....	1	1
Totals	385	213	145	397	251	18	1404	62,942	22.30	33	65	3	40	2	11	48	194	81	105	139	110	51	39	88	2	23	28	1	16	32

Death rate per 1,000, without cities, 17.76.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

CAPE MAY COUNTY. Population.....9,765 Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																					
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.			Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cape May City	8	5	1	6	3	1	24	1,699	......	....	....	....	1	....	....	....	3	1	....	1	5	2	2	1	....	....	....	....	....	....
Dennis	6	3	2	12	8	....	31	1,812	......	....	1	....	....	1	....	....	....	3	3	7	....	....	....	4	....	....	2	....	1	1
Lower	6	2	7	6	7	1	29	1,977	......	....	6	....	....	1	....	....	3	3	2	1	3	2	....	1	....	....	....	....	....	1
Middle	3	3	3	4	9	....	22	2,575	......	2	3	....	1	....	....	....	1	1	2	2	1	....	....	2	....	....	....	....	....	1
Upper	6	2	2	4	12	2	28	1,702	......	....	....	....	....	....	....	....	2	2	2	....	3	1	1	3	....	1	2	....	....	1
Cape May Point*	....	....	....	....	....	....	....	......	......	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	29	15	15	32	39	4	134	9,765	13.72	2	10	....	2	2	....	....	9	10	9	11	12	5	3	11	....	1	4	....	1	4

* Population and return are included in the lower township.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

CUMBERLAND COUNTY. Population....37,687 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bridgeton	37	39	35	47	45	5	208	8,722	23.85	2	13	....	1	....	2	43	14	14	12	15	18	10	4	11	1	7	1	....	1	10
Commercial	10	7	2	11	11	....	41	2,265	......	....	4	....	....	....	1	....	5	3	2	4	3	3	1	6	....	....	....	....	....	2
Deerfield	3	2	2	5	8	....	15	1,643	......	....	....	....	1	....	....	1	....	....	2	....	3	1	....	1	1	....	1	....	....	1
Downe	6	8	....	2	8	....	24	1,687	......	....	2	....	1	....	2	....	3	3	1	1	2	1	1	1	....	1	....	....	....	1
Fairfield	14	2	3	10	11	1	41	3,215	......	....	3	....	....	....	1	3	5	4	3	2	2	2	....	1	....	4	....	1	....	....
Greenwich	2	4	4	3	5	....	18	1,245	......	....	....	....	1	....	....	....	4	2	3	....	1	1	....	3	....	1	....	....	....	....
Hopewell	3	3	1	7	17	....	31	1,764	......	....	....	....	....	....	....	....	4	3	3	3	....	3	4	5	....	1	....	....	....	1
Landis	16	21	8	23	33	1	107	6,005	......	....	5	....	3	....	....	10	5	9	11	4	10	8	3	6	....	4	1	....	2	....
Maurice River	9	7	2	16	14	....	48	2,374	......	....	3	....	....	....	1	3	4	2	3	6	4	1	1	3	1	2	1	....	1	....
Millville	25	22	24	41	23	1	136	7,660	17.75	....	25	....	1	....	....	3	19	8	15	6	12	3	6	7	....	4	....	....	2	3
Stoe Creek	3	3	1	4	10	....	21	1,107	......	....	....	....	....	....	....	1	1	2	2	1	1	....	2	3	....	2	....	....	....	1
Totals	128	118	82	169	185	8	690	37,687	18.31	2	55	....	8	....	7	64	64	50	57	42	56	33	22	47	3	26	4	1	6	19

Death rate per 1,000, without cities, 20.94.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

ESSEX COUNTY. Population .... 189,929. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.			Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases of children.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Belleville	19	10	7	15	14	....	65	8,004	......	2	1	....	4	....	2	1	7	5	3	5	8	2	1	4	....	2	3	1	....	2
Bloomfield	17	16	12	19	18	....	82	5,748	......	3	....	....	11	....	....	5	8	7	5	7	4	4	4	5	....	3	....	....	....	1
Caldwell	11	9	3	8	14	....	45	3,167	......	....	....	....	5	1	....	3	6	4	1	7	1	2	1	4	....	....	....	....	....	....
Clinton	18	5	8	8	5	....	39	2,742	......	....	....	....	2	....	....	5	4	1	5	3	6	1	....	3	....	1	1	....	....	....
East Orange	23	21	15	28	26	1	114	8,349	13.65	2	5	....	16	....	4	5	11	7	6	8	8	3	6	5	....	6	3	....	....	3
Franklin	5	....	2	11	12	....	30	1,617	......	....	....	....	1	....	....	....	2	2	5	4	....	1	4	3	1	2	2	....	....	2
Livingston	3	2	3	2	9	....	19	1,401	......	....	....	....	....	....	....	4	....	....	1	1	....	2	1	2	....	2	....	....	....	1
Millburn	4	5	6	10	7	....	32	1,743	......	....	....	....	....	....	....	3	2	4	3	1	2	1	2	3	....	1	....	....	1	....
Montclair	23	17	13	27	21	....	101	5,147	......	2	3	....	4	....	....	14	11	4	5	10	6	4	3	5	....	5	2	....	3	1
Newark	871	959	448	1096	522	16	3912	136,508	28.66	42	97	19	310	60	47	309	374	289	262	490	377	151	138	189	10	81	58	6	32	76
Orange	83	85	44	84	39	1	336	13,207	25.44	2	5	....	28	....	8	37	34	27	17	36	35	12	11	12	1	6	5	....	7	6
South Orange	16	9	12	17	13	1	68	3,911	......	....	1	....	9	3	1	8	8	3	3	4	1	5	6	3	....	6	2	....	....	1
West Orange	19	16	5	11	17	....	68	3,385	......	....	....	....	11	....	....	2	7	3	3	5	9	1	3	4	....	3	....	....	1	1
Totals	1107	1154	578	1336	717	19	4911	189,929	26.85	53	112	19	401	64	62	401	474	356	319	581	457	189	180	242	12	118	76	7	44	94

Death-rate per 1,000, without cities, 17.23.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

GLOUCESTER COUNTY.

Population.................................25,886

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clayton	10	2	3	9	9	....	33	1,981	......	....	1	2	....	....	....	1	5	3	3	3	4	1	....	....	....	2	1	....	....	1
Deptford	11	1	1	4	5	....	22	1,520	......	1	2	1	....	....	1	....	2	1	....	3	1	1	1	2	....	....	....	....	....	1
East Greenwich	7	2	....	6	4	1	20	......	......	....	1	....	....	....	....	....	5	1	....	1	....	....	1	3	....	....	3	....	....	....
Franklin	7	5	1	13	8	....	34	2,480	......	....	1	....	1	....	....	1	2	4	4	3	3	3	1	1	....	....	....	....	1	....
Glassboro	12	10	11	19	13	....	65	2,088	......	2	2	2	1	....	....	2	4	5	8	7	9	....	1	4	....	1	1	....	....	2
Greenwich	4	2	3	12	4	....	25	2,598	......	....	4	....	....	....	1	....	4	1	1	2	....	1	2	2	....	3	....	....	....	2
Harrison	15	5	4	12	17	....	53	2,841	......	....	....	....	2	....	2	2	9	2	10	5	....	1	....	2	....	3	2	....	....	....
Logan	7	....	1	1	11	....	20	1,765	......	....	1	....	....	....	....	1	4	....	2	2	1	....	....	1	....	1	1	....	1	....
Mantua	9	1	3	7	8	....	28	1,718	......	....	5	....	....	....	....	1	3	3	2	3	1	....	....	....	1	....	....	....	1	1
Monroe	7	....	1	7	11	....	26	1,868	......	....	1	....	....	....	....	....	5	4	3	3	1	3	1	1	....	....	....	1	....	....
Washington	8	3	2	11	7	....	31	1,866	......	1	2	....	....	....	....	1	3	2	1	3	2	4	1	5	....	1	....	....	1	1
West Deptford	5	5	2	7	4	....	23	1,899	......	....	1	....	....	....	....	1	6	2	1	2	2	3	....	2	....	....	....	....	....	1
Woodbury	13	4	2	13	14	1	47	2,298	......	....	....	....	1	....	1	1	3	2	6	6	5	4	1	4	....	....	....	....	1	3
Woolwich	10	4	7	8	14	1	44	1,974	......	1	....	....	4	....	3	....	6	2	2	5	3	5	1	1	....	2	....	....	1	1
Totals	125	44	41	129	129	3	471	25,886	18.19	5	21	5	9	....	8	11	61	32	43	48	32	26	10	28	1	13	8	1	6	13

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

HUDSON COUNTY.

Population 187,944

Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.
Bayonne	73	62	26	74	18	....	253	9,372	26.89
Guttenberg	10	11	1	6	5	....	33	1,206	......
Harrison	36	35	19	62	17	1	170	6,898	24.61
Hoboken	264	223	108	286	93	....	974	30,999	31.42
Jersey City	906	774	450	1121	377	6	3636	120,722	30.12
Kearny	7	3	6	18	1	....	35	777	......
North Bergen	43	19	34	131	86	1	313	4,268	73.33
Town of Union	59	56	40	43	19	....	216	5,849	36.93
Union Township	7	10	4	9	3	1	34	1,310	......
Weehawken	12	9	6	7	5	1	40	1,102	......
West Hoboken	59	28	19	82	19	....	187	5,441	25.17
Totals	1458	1229	712	1789	642	10	5840	187,944	31.07

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.
Bayonne	5	9	....	11	1	1	13	31	8	12	50
Guttenberg	2	....	....	4	....	....	4	6	2	1	3
Harrison	7	6	....	10	1	3	8	16	17	13	23
Hoboken	13	27	25	41	5	8	118	131	68	59	91
Jersey City	35	156	209	165	58	26	234	417	221	213	418
Kearny	....	....	1	....	....	....	3	2	1	1	5
North Bergen	16	29	35	5	1	1	7	24	40	20	19
Town of Union	2	8	4	14	1	....	47	28	9	10	10
Union Township	2	....	1	8	1	....	6	1	3	3	5
Weehawken	1	1	....	2	....	....	3	9	3	2	4
West Hoboken	3	4	2	11	2	3	10	15	9	4	16
Totals	86	235	277	266	70	42	443	680	381	338	639

Statistical Divisions.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bayonne	26	4	7	9	..	8	1	....	2	16
Guttenberg	3	4	....	....	..	....	....	....	....	1
Harrison	25	5	3	4	..	3	1	2	1	4
Hoboken	96	40	34	24	2	11	10	1	11	32
Jersey City	311	120	61	137	15	106	37	4	29	147
Kearny	3	2	....	2	..	1	....	....	1	6
North Bergen	12	8	15	21	..	2	....	....	1	8
Town of Union	31	8	6	6	..	5	2	....	3	8
Union Township	1	2	2	....	..	....	....	....	1	....
Weehawken	3	1	..	1	..	1	....	....	....	5
West Hoboken	17	4	3	6	1	4	2	1	....	8
Totals	528	198	131	210	18	141	53	8	49	235

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Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

HUNTERDON COUNTY.

Population....38,570

Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.
Alexandria	1	1	....	6	14	....	22	1,324	......
Bethlehem	7	5	5	18	28	2	65	2,830	......
Clinton Township	7	2	....	9	19	....	37	2,133	......
Delaware	3	1	3	11	22	....	40	3,692	......
East Amwell	6	2	....	4	14	....	26	1,696	......
Franklin	2	....	....	4	3	....	9	1,338	......
Frenchtown	1	3	4	4	10	....	22	1,089	......
High Bridge	10	3	4	10	9	....	36	2,209	......
Holland	2	1	....	9	6	....	18	1,886	......
Kingwood	2	1	....	3	11	1	18	1,694	......
Lambertville	17	4	7	16	23	2	69	4,183	......
Lebanon	12	3	3	13	16	....	47	2,699	......
Raritan	12	3	4	10	24	1	54	4,188	......
Readington	8	5	3	12	24	....	52	3,108	......
Tewksbury	4	3	2	3	15	....	27	2,108	......
Town of Clinton	3	1	1	2	3	....	10	843	......
Union	3	2	2	2	5	....	14	1,168	......
West Amwell	3	1	3	5	2	....	14	1,089	......
Totals	108	41	40	136	244	6	570	38,570	14.77

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alexandria	....	1	....	....	....	1	....	....	2	....	4	....	2	2	5	....	....	....	....	....	....
Bethlehem	....	5	....	2	....	1	....	3	3	3	2	3	6	2	6	1	1	2	....	....	5
Clinton Township	....	1	....	2	....	2	....	1	3	4	2	1	3	....	6	....	....	2	....	1	3
Delaware	....	1	....	....	1	....	1	....	3	3	1	2	3	5	10	....	1	1	....	....	2
East Amwell	....	....	....	....	....	1	....	4	1	1	2	1	4	....	4	....	1	3	....	....	1
Franklin	....	....	....	....	....	....	....	....	....	1	....	....	2	1	3	....	....	1	....	....	....
Frenchtown	1	1	....	4	....	....	....	2	....	2	....	....	3	....	1	....	3	1	....	....	....
High Bridge	2	1	....	....	....	....	1	5	1	2	3	2	3	....	2	1	....	....	....	2	....
Holland	2	3	1	....	....	....	....	....	1	1	3	1	2	1	1	....	....	....	....	2	....
Kingwood	....	....	....	....	1	....	....	2	....	1	2	....	2	....	3	....	1	1	....	....	2
Lambertville	1	....	....	....	....	....	2	7	5	7	9	1	2	2	7	....	3	2	....	....	3
Lebanon	2	3	....	2	....	....	....	5	1	1	4	4	2	1	4	....	2	3	1	2	1
Raritan	....	2	....	1	1	....	....	7	....	3	6	3	5	6	6	....	....	2	1	....	1
Readington	....	2	....	2	....	....	1	4	5	2	4	3	4	4	6	....	3	2	....	....	3
Tewksbury	....	2	....	....	....	....	1	1	....	2	2	1	6	2	1	2	....	....	....	....	1
Town of Clinton	....	....	....	1	....	....	....	1	1	....	1	....	3	....	....	....	....	....	....	....	....
Union	1	1	....	1	....	1	....	2	....	1	3	....	2	....	1	....	....	....	....	....	....
West Amwell	....	1	....	....	....	....	....	3	....	2	....	1	2	....	....	....	....	1	....	1	....
Totals	9	24	1	15	3	6	6	47	26	36	54	23	56	26	66	4	14	20	2	8	21

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

MERCER COUNTY.

Population 58,061

Statistical Divisions.	Deaths at all ages: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.
Chambersburg	48	21	19	27	18	3	136	5,437	25.01
East Windsor	3	4	1	17	14	2	41	2,371	......
Ewing	4	1	....	51	29	....	85	2,412	......
Hamilton	11	7	5	29	24	2	78	3,370	......
Hopewell	15	12	10	17	22	1	77	4,463	......
Lawrence	13	10	4	21	7	....	55	3,174	......
Millham	1	....	....	....	2	....	3	......	......
Princeton	24	12	9	17	23	....	85	4,848	......
Trenton	141	76	53	216	107	21	614	29,910	20.53
Washington	1	1	....	7	8	....	17	1,281	......
West Windsor	4	1	1	3	9	....	18	1,896	......
Totals	265	145	103	405	263	29	1209	58,061	20.82

Statistical Divisions.	Principal causes of death: Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Chambersburg	2	6	....	4	....	4	8	21	7	8	22	9	5	1	5	....	5	1	....	....	2
East Windsor	1	2	1	....	4	....	....	1	2	2	5	2	4	1	5	....	3	2	....	....	2
Ewing	....	3	....	....	....	....	....	1	13	4	4	....	4	2	29	3	5	....	....	....	2
Hamilton	3	1	....	....	....	....	3	9	17	3	4	1	7	1	9	1	1	2	....	1	....
Hopewell	....	1	....	2	2	1	6	8	3	7	2	4	4	2	12	....	4	2	....	....	1
Lawrence	3	1	....	1	....	....	2	7	4	3	5	3	2	....	3	....	1	1	....	1	4
Millham	....	....	....	....	....	1	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....
Princeton	1	2	1	1	....	1	3	6	7	7	8	9	1	3	8	....	5	3	....	....	1
Trenton	8	20	17	....	5	3	21	75	59	67	69	32	25	14	29	5	12	9	3	1	22
Washington	....	1	....	....	....	1	....	....	2	....	....	....	....	....	4	....	....	1	....	1	3
West Windsor	....	....	....	2	....	....	....	....	....	1	....	2	....	2	5	1	....	....	....	1	....
Totals	18	37	19	10	11	11	43	128	115	102	119	62	52	26	109	10	36	22	3	5	37

Death-rate per 1,000, without cities, 20.21.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

MIDDLESEX COUNTY. Population....52,286 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cranbury	7	8	2	10	7	....	29	1,599	......	....	1	....	....	....	....	....	2	2	4	5	1	2	3	1	....	1	1	1	1	1
East Brunswick	17	8	8	18	13	3	67	3,272	......	....	2	....	7	....	1	2	7	1	2	5	1	5	2	7	1	3	1	....	2	1
Madison	5	2	2	5	7	....	21	1,662	......	1	1	1	....	....	....	1	2	2	1	3	1	....	....	1	....	1	1	....	....	2
Monroe	5	1	5	15	15	....	41	3,017	......	....	2	....	....	....	....	....	4	4	3	5	1	2	2	6	....	1	....	....	....	2
New Brunswick	93	57	49	113	75	4	319	17,166	22.78	6	12	9	20	....	4	14	46	20	37	36	30	14	15	17	3	11	12	1	1	12
North Brunswick	4	1	....	4	10	....	14	1,251	......	....	1	....	....	....	....	....	2	1	....	5	....	1	2	1	....	....	....	....	....	....
Perth Amboy	37	29	13	39	14	2	134	4,808	......	4	3	1	5	....	3	3	20	4	13	9	16	6	....	7	....	4	1	2	1	7
Piscataway	5	8	6	14	21	....	54	3,242	......	1	3	....	....	....	....	3	3	2	....	3	1	4	1	6	....	2	....	....	....	2
Raritan	9	5	10	17	18	1	60	3,789	......	....	3	....	....	....	....	4	2	3	6	6	3	3	4	5	....	1	1	....	....	6
Sayreville	7	6	1	9	3	....	26	1,930	......	....	1	....	1	1	....	3	6	....	....	3	2	....	....	1	....	1	....	....	1	2
South Amboy	18	16	7	37	13	....	91	3,648	......	2	....	....	6	....	....	4	6	7	5	7	3	4	1	5	....	4	3	....	2	12
South Brunswick	5	3	1	8	19	1	37	2,808	......	....	1	....	1	....	....	....	2	3	2	3	....	2	1	2	....	4	2	....	....	....
Woodbridge	26	12	9	22	16	....	85	4,099	......	1	3	....	3	....	....	6	11	8	7	9	5	2	2	3	....	....	....	1	2	3
Totals	238	151	113	311	231	11	1055	52,286	20.18	15	33	11	43	1	8	45	110	57	80	104	64	45	33	61	4	38	23	5	10	50

Death-rate per 1,000, without cities, 18.91.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

MONMOUTH COUNTY. Population..........55,538 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	4	6	4	9	8	....	31	1,743	......	1	1	2	5	....	....	1	1	4	1	2	2	1	2	3	....	....	....	....	....	....
Eatontown	15	7	1	10	12	....	45	2,642	......	1	2	....	2	....	....	1	7	1	2	4	2	7	2	4	....	1	1	....	....	2
Freehold	12	5	11	26	23	1	78	4,302	......	1	....	1	2	....	3	1	3	5	8	11	4	8	4	13	1	4	1	....	1	1
Holmdel	3	....	1	8	4	....	16	1,575	......	....	....	....	....	....	....	....	1	3	1	2	1	1	1	2	....	....	....	....	....	....
Howell	15	5	4	20	17	3	64	3,374	......	....	4	....	1	....	....	....	9	2	2	4	5	3	3	12	....	4	....	....	....	2
Manalapan	4	1	1	6	13	5	30	2,175	......	....	....	....	....	....	1	....	....	1	2	2	2	4	2	5	....	1	....	1	....	....
Marlboro	2	4	4	9	8	....	27	2,198	......	....	2	....	1	....	....	2	2	....	2	2	1	3	2	2	....	3	....	....	....	....
Matawan	11	14	9	22	17	....	73	2,669	......	1	2	....	2	....	2	7	7	7	7	8	5	....	5	2	....	3	2	1	....	3
Middletown	15	11	7	20	30	....	83	5,069	......	1	....	1	4	1	....	2	8	3	4	7	5	10	5	8	....	3	2	....	....	3
Millstone	8	1	1	8	9	....	27	2,080	......	....	1	....	....	....	....	....	1	1	3	6	1	1	1	1	....	....	1	....	....	2
Neptune	54	22	18	49	31	4	178	4,187	......	3	1	....	12	2	2	2	35	9	6	18	15	11	4	10	....	5	1	....	1	10
Ocean	39	21	13	40	28	5	146	6,027	......	1	2	....	6	....	2	5	23	6	8	21	7	9	6	13	1	5	1	1	1	9
Raritan	16	9	6	25	25	3	84	3,891	......	....	2	1	2	....	....	4	9	9	5	8	2	3	3	5	2	3	3	1	....	4
Shrewsbury	23	13	15	38	34	2	125	6,526	......	....	3	....	3	....	....	2	12	8	3	8	10	7	6	16	....	8	3	1	....	4
Upper Freehold	8	....	3	20	28	....	59	3,286	......	....	1	....	....	....	1	....	2	5	13	2	....	3	1	8	....	3	2	....	....	....
Wall	21	10	8	27	19	2	87	3,839	......	....	3	....	....	....	....	6	10	4	5	9	3	5	4	10	....	5	2	....	2	1
Totals	250	129	106	337	306	25	1153	55,538	20.76	9	24	5	40	3	11	33	130	68	72	113	65	76	51	114	4	48	19	5	5	41

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

MORRIS COUNTY. Population ......50,861 Statistical Divisions.	DEATHS AT ALL AGES: Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boonton	9	4	8	15	17	....	53	2,683	......	1	2	....	3	....	....	5	1	2	5	4	1	4	2	8	....	2	....	....	....	1
Chatham	15	10	8	27	25	1	86	4,276	......	3	4	....	7	....	2	6	4	9	6	8	4	6	4	3	....	3	....	....	4	2
Chester	14	3	4	14	12	....	47	2,387	......	1	1	....	....	....	....	1	7	2	2	5	1	8	1	1	....	1	1	....	1	4
Hanover	7	6	7	57	46	2	125	4,138	......	4	1	....	1	....	....	7	3	7	7	18	2	8	4	33	....	3	....	....	1	....
Jefferson	2	5	3	10	6	....	26	1,752	......	....	....	....	....	....	....	2	1	1	3	2	2	5	....	2	1	1	....	....	....	4
Mendham	2	1	1	10	10	....	24	1,536	......	1	....	....	....	....	....	....	2	3	3	2	1	....	1	3	....	3	1	....	....	....
Montville	7	4	3	11	14	....	39	1,270	......	....	5	....	....	....	....	3	3	1	4	4	2	1	2	5	....	....	1	1	....	....
Morristown	23	15	13	41	29	1	121	6,837	17.70	2	....	....	3	....	....	3	15	12	10	9	9	7	5	8	....	9	4	1	....	4
Mount Olive	9	6	2	11	7	1	36	1,962	......	1	....	....	2	1	....	1	5	2	4	2	4	3	....	2	....	....	2	....	....	3
Passaic	7	1	2	8	11	1	30	1,896	......	....	....	....	1	....	....	1	4	1	2	7	2	1	....	1	....	3	....	....	....	....
Pequannock	4	15	16	12	6	1	54	2,229	......	2	....	....	15	....	....	8	2	1	2	4	3	4	4	2	....	....	....	....	1	....
Randolph	33	32	28	31	19	3	146	7,700	......	3	2	....	21	....	3	9	18	5	3	17	14	7	2	5	....	2	3	....	3	7
Rockaway	27	23	28	33	34	....	145	7,366	......	2	6	....	26	....	1	2	9	3	6	34	12	4	6	4	....	4	2	....	....	10
Roxbury	10	7	3	10	3	....	33	2,189	......	....	3	....	6	....	1	2	3	1	1	2	3	2	1	1	....	1	1	....	....	....
Washington	9	5	2	12	6	....	34	2,681	......	1	2	....	1	....	....	....	4	2	....	2	1	2	1	4	....	3	....	....	....	3
Totals	177	147	138	302	235	10	999	50,861	19.64	21	26	....	86	1	7	50	76	53	68	190	61	57	33	86	1	35	15	2	10	38

Death-rate per 1,000, without cities, 19.94.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

OCEAN COUNTY. Population .... 14,455 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Berkley	3	1	....	2	3	....	9	683	......	....	....	....	....	....	....	....	....	....	1	1	1	1	....	1	1	2	....	....	....	....
Brick	6	7	2	14	7	1	37	2,990	......	....	2	....	....	1	1	....	3	....	7	4	5	1	....	3	....	....	1	1	1	....
Dover	8	1	3	11	8	1	32	2,439	......	....	2	....	....	....	....	4	1	4	5	4	1	2	....	1	....	1	....	....	....	1
Eaglewood	2	1	2	5	4	....	14	592	......	....	....	....	....	....	....	....	....	1	3	....	3	1	1	....	....	....	....	2	....	....
Jackson	2	1	1	9	4	....	17	1,803	......	....	1	....	....	....	....	....	2	2	2	1	....	2	....	2	....	1	1	....	....	1
Lacey	4	1	4	6	1	....	16	814	......	....	1	....	....	....	....	4	....	1	2	1	1	1	....	1	....	1	....	....	....	....
Manchester	5	2	5	4	2	....	18	1,057	......	....	1	....	1	....	....	3	2	2	1	1	2	....	....	2	....	1	....	....	1	....
Ocean	3	2	....	4	2	....	11	484	......	....	....	....	....	....	....	....	....	....	....	1	2	1	....	1	....	....	....	....	1	....
Plumsted	13	....	....	9	6	....	28	1,561	......	....	1	....	....	....	1	2	5	4	2	2	2	3	....	....	....	....	1	....	....	....
Stafford	2	....	1	8	7	1	19	1,088	......	....	1	....	....	....	....	....	....	3	3	....	1	1	....	2	....	....	....	....	....	....
Union	7	....	....	7	4	....	18	1,024	......	....	1	....	....	....	....	....	3	2	3	1	1	....	....	....	....	4	....	....	....	....
Totals	55	16	18	79	48	3	219	14,455	15.15	....	10	....	1	1	2	13	16	19	29	16	19	13	1	13	1	10	3	3	3	2

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

PASSAIC COUNTY.

Population.............................68,860

Statistical Divisions.	DEATH AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Aquackanonck..................	3	4	3	3	7	1	21	1,781	......	....	....	...	3	....	....	1	1	2	....	4	1	....	....	2	....	1	3	....	....	1
Little Falls..................	6	8	6	10	7	....	37	1,404	......	....	1	....	5	....	....	1	3	3	2	2	4	2	....	5	....	1	....	....	2	2
Manchester..................	5	1	2	9	4	....	21	1,513	......	....	1	....	....	....	....	....	1	1	2	3	2	1	....	2	....	3	....	....	....	1
Passaic City..................	47	28	17	33	24	1	149	6,531	23.83	3	9	....	6	....	4	3	24	5	18	12	15	7	4	6	1	3	....	....	2	7
Paterson..................	417	280	150	463	221	....	1511	51,181	19.61	24	49	3	101	3	10	37	232	106	112	178	108	57	51	52	6	63	19	5	12	31
Pompton..................	13	10	7	9	6	1	46	2,251	......	2	....	....	7	....	....	4	5	1	2	2	3	3	2	2	....	2	1	....	....	....
Wayne..................	3	2	3	6	4	....	17	1,757	......	....	....	....	2	....	....	1	2	3	1	....	2	....	....	....	....	....	....	....	....	1
West Milford..................	6	9	10	8	11	1	45	2,591	......	1	1	....	10	....	....	6	1	2	1	2	1	3	1	5	....	2	....	1	....	2
Totals..................	500	823	197	540	284	4	1847	68,860	26.82	30	61	3	134	3	14	53	269	128	138	208	136	73	58	74	7	75	23	6	16	45

Death-rate per 1,000, without cities, 16.55.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

SALEM COUNTY.

Population..24,579

Statistical Divisions.	Deaths at all ages. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Elsinboro	2	....	....	2	1	....	5	570	......
Lower Alloways Creek	4	....	1	4	5	....	14	1,373	......
Lower Penn's Neck	7	1	4	3	9	....	24	1,834	......
Mannington	12	11	3	16	17	....	59	2,230	......
Oldmans	4	4	2	2	4	1	17	......	......
Pilesgrove	10	9	8	18	21	1	67	3,497	......
Pittsgrove	8	12	8	8	8	....	44	1,778	......
Quinton	3	4	3	4	5	1	20	1,890	......
Salem	19	11	10	25	32	2	99	5,056	19.58
Upper Alloways Creek	2	2	3	7	14	....	28	1,917	......
Upper Penn's Neck	11	5	7	7	8	4	42	3,361	......
Upper Pittsgrove	9	5	1	8	13	....	36	2,073	......
Totals	91	64	50	104	137	9	455	24,579	18.51

Statistical Divisions.	Principal causes of death. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.
Elsinboro	....	....	....	....	....	....	....	1	1	....
Lower Alloways Creek	....	1	....	....	....	....	....	1	1	....
Lower Penn's Neck	....	....	....	....	....	....	1	3	2	3
Mannington	2	2	....	....	....	4	2	1	5	9
Oldmans	....	1	....	2	....	1	....	2	1	1
Pilesgrove	....	5	....	1	....	4	4	....	9	6
Pittsgrove	....	2	....	....	....	1	10	5	3	1
Quinton	....	....	....	....	1	....	1	2	1	2
Salem	3	5	....	1	....	....	2	6	8	12
Upper Alloways Creek	....	....	....	1	....	....	3	1	3	4
Upper Penn's Neck	....	1	....	2	....	....	1	5	1	4
Upper Pittsgrove	....	5	....	....	....	3	3	3	4	....
Totals	5	22	....	7	1	13	27	30	39	42

Statistical Divisions.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Elsinboro	....	....	....	....	1	....	1	....	....	....	....
Lower Alloways Creek	....	....	....	....	2	....	4	1	....	....	....
Lower Penn's Neck	4	....	4	....	2	....	....	....	....	....	....
Mannington	7	1	3	1	5	1	1	....	....	....	1
Oldmans	....	1	....	....	1	....	1	....	....	1	....
Pilesgrove	6	4	4	....	3	....	5	2	1	....	1
Pittsgrove	4	2	2	1	4	....	....	2	....	....	1
Quinton	....	2	1	2	....	1	1	....	....	1	....
Salem	7	7	4	2	9	....	....	6	....	1	1
Upper Alloways Creek	1	....	3	....	3	....	1	1	....	1	1
Upper Penn's Neck	5	3	3	....	2	....	3	1	....	....	3
Upper Pittsgrove	5	....	1	....	3	1	....	....	....	....	....
Totals	39	20	25	6	35	3	17	13	1	4	8

Death-rate per 1,000, without cities, 18.24.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

SOMERSET COUNTY.

Population.............................27,162

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.
Bedminster	9	5	5	10	11	....	40	1,812	......
Bernards	11	6	3	14	13	....	47	2,612	......
Branchburg	4	2	1	7	10	....	24	1,316	......
Bridgewater	34	18	23	34	43	2	154	7,997	......
Franklin	14	5	8	17	27	2	73	3,818	......
Hillsborough	9	2	5	18	17	1	52	3,248	......
Montgomery	4	6	1	4	13	....	28	1,938	......
North Plainfield	12	4	12	15	17	....	60	3,217	......
Warren	2	4	6	10	4	....	26	1,204	......
Totals	99	53	64	129	155	5	504	27,162	18.55

PRINCIPAL CAUSES OF DEATH.

Statistical Divisions.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bedminster	3	....	....	3	....	....	....	6	....	2	1	4	2	....	9	....	3	3	....	....	1
Bernards	2	1	....	1	....	....	2	8	1	1	7	3	1	2	5	1	4	....	....	3	....
Branchburg	1	....	....	....	....	....	....	1	....	2	1	2	1	3	6	....	2	1	....	....	....
Bridgewater	7	4	....	4	3	....	9	12	4	7	13	11	12	4	16	1	9	....	....	5	8
Franklin	2	2	....	....	1	1	3	5	2	3	10	4	8	4	4	...	10	2	....	1	3
Hillsborough	1	....	....	....	1	....	5	1	2	4	9	6	10	1	1	1	8	2	....	....	1
Montgomery	....	....	....	....	....	1	1	3	1	2	3	2	1	2	5	....	....	2	1	....	....
North Plainfield	....	1	....	2	1	1	2	4	3	8	8	....	3	2	3	3	2	....	....	....	5
Warren	....	4	....	....	....	....	1	2	4	3	1	2	3	1	2	....	1	....	....	....	1
Totals	16	12	....	10	6	3	23	42	17	33	53	34	41	19	51	6	34	10	1	9	19

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

SUSSEX COUNTY. Population....23,539 Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Andover	3	4	4	8	10	....	29	1,150	......	2	1	....	1	....	....	....	5	1	1	2	2	3	1	6	....	1	....	....	....	1
Byram	5	5	1	2	11	....	24	1,406	......	....	2	....	....	1	....	2	4	....	....	3	2	....	....	2	....	2	....	....	....	2
Frankford	4	3	3	7	8	1	26	1,683	......	....	....	....	4	....	....	2	1	1	2	1	1	3	....	1	....	1	....	....	....	2
Green	....	....	....	3	1	....	4	727	......	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	1
Hardyston	18	12	11	14	18	2	70	2,645	......	2	1	....	12	....	....	4	2	1	1	12	5	7	2	2	....	4	2	....	....	4
Hampton	1	7	1	2	1	1	13	896	......	....	....	....	2	....	....	3	....	....	....	....	....	....	....	1	1	....	....	....	....	....
Lafayette	2	....	....	8	8	....	18	781	......	....	....	....	....	....	....	....	....	1	1	2	....	2	1	1	....	....	....	....	1	2
Montague	4	....	....	5	6	....	15	1,022	......	....	....	....	....	....	....	....	1	....	1	1	....	1	2	....	1	1	....	....	1	....
Newton	10	16	10	19	5	4	64	2,513	......	....	3	....	10	....	....	4	7	2	4	2	7	7	4	3	....	1	....	....	2	1
Sandyston	....	2	4	3	11	2	22	1,196	......	....	....	....	3	....	....	....	1	2	2	2	....	....	2	2	....	1	2	....	....	....
Sparta	10	6	5	11	8	3	43	2,274	......	1	1	....	1	....	....	....	5	5	4	2	3	1	3	2	....	2	....	....	1	1
Stillwater	3	6	3	12	14	1	39	1,503	......	2	2	....	6	....	....	2	2	1	3	3	1	4	1	1	1	3	....	....	....	1
Vernon	2	4	4	7	13	....	30	1,811	......	1	....	....	1	....	....	3	....	3	5	2	1	1	....	2	....	5	1	....	....	....
Wallpack	....	....	2	2	....	....	4	575	......	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....
Wantage	6	8	6	13	21	....	54	3,361	......	1	5	....	3	1	....	1	4	4	2	6	1	3	5	4	....	1	2	....	1	1
Totals	68	73	54	116	135	14	455	23,539	19.32	9	17	....	44	2	....	26	32	21	26	38	23	33	21	27	3	22	8	....	7	16

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending July 1st, 1882.

UNION COUNTY.

Population 55,571

Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.
Clark	3	....	....	3	3	....	9	358	......	....	....	....	....	....	....
Cranford	3	2	1	3	1	....	10	1,184	......	....	1	....	....	....	1
Elizabeth	148	131	74	165	91	3	612	28,229	21.68	13	7	....	41	10	6
Fanwood	4	2	3	2	6	....	17	1,167	......	3	....	....	1	....	....
Linden	6	7	1	13	11	....	38	1,869	......	1	1	....	1	....	....
New Providence	7	....	....	10	3	1	21	781	......	....	1	....	....	....	1
Plainfield	34	20	20	30	47	....	151	8,126	18.58	....	[illegible]	....	5	7	....
Rahway	33	37	23	46	45	....	183	6,455	28.35	1	[illegible]	3	15	3	2
Springfield	1	2	1	3	3	....	10	844	......	2	....	....	....	....	....
Summit	10	7	2	16	6	....	41	1,910	......	2	[illegible]	....	....	....	....
Union	6	3	1	8	9	....	27	2,418	......	1	....	....	1	....	....
Westfield	10	12	5	19	11	1	58	2,216	......	1	1	....	8	....	5
Totals	265	228	130	318	236	5	1177	55,571	21.18	24	21	3	72	20	15

Statistical Divisions.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clark	....	....	....	....	1	1	....	....	1	....	1	....	....	3	....
Cranford	....	....	....	1	2	2	....	....	....	....	....	....	....	....	1
Elizabeth	36	65	38	39	56	70	28	10	33	....	18	11	1	4	30
Fanwood	3	3	....	....	1	....	....	....	....	....	....	1	....	....	....
Linden	....	3	2	3	3	6	2	2	2	....	2	1	....	1	....
New Providence	....	2	5	1	1	3	....	....	....	....	1	3	....	....	1
Plainfield	10	17	5	17	28	9	6	7	10	1	3	3	....	....	[illegible]
Rahway	10	13	9	11	36	15	14	4	8	2	7	3	....	1	3
Springfield	....	....	1	....	2	1	....	....	1	....	....	....	....	....	....
Summit	4	6	3	5	3	2	....	1	2	....	....	....	....	2	1
Union	....	1	2	4	4	1	2	....	....	1	2	1	....	....	2
Westfield	....	4	5	5	5	3	3	1	1	....	2	1	....	1	2
Totals	63	114	70	86	137	118	55	25	57	4	31	24	1	12	48

Death-rate per 1,000, without cities, 18.01.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending July 1st, 1882.

WARREN COUNTY. Population .... 36,589. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Undefined.	Total, including undefined.	Population, census of 1880.	Death rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Consumption. M.	Consumption. F.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Allamuchy	3	3	2	1	5	....	14	648	......	1	....	....	....	2	....	....	....	....	....	1	2	1	....	....	....	1	....	....	....	....
Belvidere	3	6	8	7	10	....	34	1,773	......	1	....	....	7	1	....	1	1	....	2	4	....	2	2	3	....	....	1	1	1	....
Blairstown	5	4	2	6	11	....	28	1,458	......	....	....	....	....	....	....	....	3	1	5	5	3	2	1	1	1	2	1	1	....	....
Franklin	6	3	5	5	11	....	30	1,529	......	....	....	....	2	....	....	1	5	1	2	1	3	3	2	3	....	2	....	1	....	....
Frelinghuysen	....	....	....	1	3	2	6	1,042	......	1	....	....	....	....	....	....	....	1	....	1	....	2	....	....	....	....	....	....	....	1
Greenwich	13	6	6	12	12	1	51	2,554	......	....	2	....	3	....	....	6	7	1	3	2	2	3	1	3	....	....	2	1	1	2
Hackettstown	10	15	7	16	10	....	58	2,502	......	2	1	....	10	....	....	2	4	1	7	3	7	3	....	1	1	2	1	....	1	2
Hardwick	....	2	1	2	2	....	7	583	......	....	....	....	....	....	....	....	....	1	....	....	1	....	1	2	....	....	....	....	....	....
Harmony	7	2	8	6	7	1	31	1,350	......	1	....	....	....	....	....	3	2	1	3	1	1	1	....	2	....	....	....	....	1	2
Hope	7	10	7	5	5	1	35	1,569	......	....	1	....	5	....	....	2	6	2	3	2	1	2	1	1	....	1	1	....	....	....
Independence	2	2	4	8	....	....	16	1,018	......	....	2	....	....	....	....	....	....	2	1	3	1	1	....	1	....	3	....	....	....	....
Knowlton	5	2	10	7	13	....	37	1,476	......	....	4	....	1	....	....	3	2	2	1	5	3	1	1	4	....	....	1	....	....	1
Lapatcong	8	5	3	4	9	....	29	1,591	......	....	1	....	....	....	....	6	4	....	....	1	1	....	....	4	....	1	....	....	....	....
Mansfield	7	8	8	8	16	2	49	1,709	......	....	....	....	6	1	1	3	2	1	3	7	3	1	....	5	....	5	....	....	....	....
Oxford	26	28	19	22	16	1	112	4,594	......	....	2	7	19	....	....	4	16	1	4	17	8	2	2	6	1	2	....	....	3	4
Pahaquarry	....	....	....	....	....	....	....	418	......	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Phillipsburg	54	34	21	34	26	....	169	7,181	23.53	2	6	....	....	....	3	26	24	15	6	18	18	11	1	10	....	2	1	....	2	1
Pohatcong	1	3	2	6	1	....	13	......	......	1	1	....	....	....	....	....	....	....	1	4	1	2	....	1	....	....	....	....	....	....
Washington Borough	12	11	14	19	6	2	64	2,142	......	....	6	....	3	1	1	....	6	2	6	4	3	3	1	6	1	....	....	....	....	4
Washingtown Township	5	2	5	8	11	....	31	1,452	......	....	1	3	1	....	1	....	3	1	1	4	....	2	1	3	1	....	1	....	1	1
Totals	174	146	132	178	174	10	814	36,589	22.24	9	27	10	62	5	6	62	85	33	48	78	58	42	14	56	5	21	9	4	10	18

Death-rate per 1,000, without cities, 21.94.

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REPORT OF THE BUREAU OF VITAL STATISTICS.

NOTE.—The article alluded to, page 28 of Report, is postponed until the next Report.

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